# UNIT TESTS IN PHYSICS

FOR

CLASS XI

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# FOREWORD

The National Policy on Education, 1986 had ennunciated two major goals of Examination Reform programmes, first that of improving the valcity and reliability of examinations and secondly that of making them powerful instruments of improving teaching and learning. The second objective, however, could not be adequately attended to. It was, therefore, considered desirable by the framers of the 1986 policy to re-state this with an elaborated statement so that its purport is not missed.

Formative evaluation being the genesis of any programme aimed at the achievement of the above goal, Unit Testing has to be an important aspect of the same.

It may, however, be mentioned that the purpose of preparing and using Unit Tests has not just to be limited to the identification of weaknesses of students but also to the discovery of their merits. While remedial programmes would need to be designed for the former, enrichment programmes will have to be pressed into service for the latter.

One other characteristic which the unit tests ought to possess, is that, they should not just concentrate on the contents of the units only but also take into account the evaluation of those facets of the subject matter, which are related to the content unit in questions.

I am happy that as a part of the department's programmes of formative evaluation Dr. Avtar Singh, Reader in the Department has guided the development of unit test which are contained in the document presented here. I congratualate him and all the teachers, teacher educators and content experts who participated in the preparation of the tests.

Suggestions for the improvement of the document are earnestly solicited and will be thankfully received.

( H.S.Srivastava )
Prof. & Head

# ACKNOWLEDGEMENT

The Contribution of all the teachers in developing unit tests are greatly acknowledged by the author. During two workshops, their interest and hard work has helped me to bring out this brochure. I am grateful to Prof. H.S.Srivastava, Head, Department of Measurement, Evaluation, Survey and Data Processing for guiding and taking keen interest in the project. His valuable suggestions has helped me in planning and executing and project. My sincere thanks are to Shri M.Lingmurthy, P.G.T. (Physics), ST. Anthony School, Hauz Khas, New Delhi and Shri B.K.Badri, PGT (Physics) Kendriya Vidyalaya, Mahrauli Road, New Delhi who administered these unit tests in their schools and gave me useful feedback. Keeping in view the tryout results, some items were modified to achieve the desired objectives. The cooperation of my colleagues in the department is highly appreciable. Finally the help extended by section staff is duely acknowledged,

I earnestly look forward to the comments and suggestions from all those concerned with teaching and testing of Physics in schools.

Dated: Sept. 20,1990

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## INTRODUCTION

### A) UNIT TEST

Evaluation is an important auspect of teaching learning process. Moreover evaluation is a continuous process. The teaching and testing go together. Even while teaching i.e. organising learning activities, the teacher can evaluate. The pupils responses or reactions in the form of replying a question, performance, facial expression etc, make evaluation a continuous process. Both learning and testing are equally important. Testing if properly done, leads to good learning. Infect, teaching, learning and testing are all supplementary in the whole education process. Testing should be pre-planned, systematic and scientific.

Now-a-days the testing at the end of entire course (annual examination) or till half the course is complete is considered unscientific and meaningless for the pupils. Pupils should be evaluated [illegible] at short intervals. Some of the stages of evaluating the pupil are

i) during teaching (one extreme)
ii) at the end of daily lesson
iii) at the end of a unit
iv) at the end of a term
v) at the end of year (another extreme)

Testing while teaching is a difficult proposition. On the otherhand testing at the end of a year is easy but purposeless. So the best and most practical way is to hold a test after teaching each unit i.e. a unit test. Dividing the course into closely related but independent units and holding unit tests regularly fulfills the following aims.

1. It motivates the learner to be attentive and regular in the classroom.
2. The teacher evaluates pupil regularly and takes remedial measures to overcome pupil's weaknesses.

3. The teacher also gets an effective feedback to improve his instructions as well as methodology.

4. While improving teaching-learning process, unit tests also help to develope better curriculum for teaching.

5. These tests are also useful for self evaluation of students.

A unit test is not merely a collection of few questions or a test of 20 to 25 marks instead of 100 marks. A unit test is a test structured according to a systematic pattern decided in advance with due weightages to various sub-units and objectives. Some of the steps necessary for a meaningful and good unit test are given below in brief.

B. "How to prepare a Unit Test"

1. DESIGN :-

To begin with a proper design is prepared to increase the validity, reliability, objectivity and practability of the test and for that different weightages are

1.1) Weightage to objectives:-

Considering the relative importance of each subject and the nature of the content in the unit, weightage is fixed for differen objective i.e. Knowledge (K), Understanding (U), Applications (A), and Skill (S). This weightag can very from unit to unit depending upon the nature of the content.

1.2) Weightage to content :-

For wider coverage, weightage is fixed for each sub-unit in the unit depending upon its scope and nature.

1.3) Weightage to form of questions :-

For testing different abiliti all types of questions are set in the unit test i.e

Long Answer Type (LA), Short Answer Type (SA), Objective type (OT).

1.4) Weightage to difficulty level:-

To cover all pupil in the class, the test should be neither too easy nor too difficult. So appropriate weightage to easy, average and difficult typequestions is fixed.

1.5) In the design, a decision about scheme of sections and options is also taken. Traditional overall options should be discouraged and wherever necessary internal option should be given.

2. BLUE PRINT :-

All the decision taken in the design are transferred into a three dimensional chart displaying weightages to objectives, content and form of questions in terms of marks.

3. EDITING OF A QUESTION PAPER :-

Once design and blue print are prepared, then it a question of preparing good items. Different types of questions are put to-gather according to some pattern normally from easy to difficult. Clear instructions are given to the examinee in the beginning of a question paper indicating the marks and scope of each question.

4. SCORING KEY AND MARKING SCHEME :-

A scoring key for objective type questions and a marking scheme for other questions is essential to bring uniformity in assessing and thus to increase objectivity. Marking scheme also helps to improve the quality of item also.

5. QUESTION WISE ANALYSIS :-

Finally, before administering the test it is necessary to carry questionwise analysis.

It determines the content validity of the test. It also checks whether weightages fixed in design are fulfilled. The strength and weaknesses of the test is evident from questionwise analysis.

In the present work, class XI syllabus is divided into 12 units. For each unit, a design blue print and a question paper is prepared fixing appropriate weightages of sub units, form of questions and learning objectives A detailed marking scheme and questionwise analysis for each unit is also prepared.
Each unit test is of 25 marks and of 30 minutes duration so that teacher is able to complete it in class period. To ensure a good standard of items, a tryout of all the 12 units in two different schools were carried and some items replaced so that these satisfy the characteristics of a good test.

## 3. LEARNING OBJECTIVES AND THEIR SPECIFICATION :-

For the overall development of a pupil, all the three domains i.e. cognitive, affective and psychomotor are equally important. Various taxionomics have classified the objectives in educational process The objectives in cognitive domain are classifed into six classes in hierarchical order i.e. knowledge, understanding, application, analysis, synthesis and evaluation. In the present twelve unit tests, items testing first three objectives are framed as they are more relevant to schools education.

Drawing skills of psychomotor domain are also tested alongwith knowledge and understanding in few questions. It is worth mentioning that knowledge is simply recall/ memoriastion from the text whereas understanding is a higher ability based on knowledge. Simple calculations solving numberical problems, explaining principles involves understanding. The application is still a higher

ability ..

It is not simple applications of formulae. This should be born in mind while going through these tests. Difficult and totally unfamiliar problems, numbericals, explanations, belong to this objective. The application items help us to discriminate the pupils better. It is suggested that before trying these unit tests readers should go through the objectives and their specifications. There may be some overlapping in intrepreting objectives but basics must be understood.

## OBJECTIVES AND THEIR SPECIFICATIONS

### 1.0 OBJECTIVE : KNOWLEDGE

To acquire the knowledge of terms, facts, concepts, definitions, fundamental laws, principles and processes in the field of physics.

Specifications :

To demonstrate the achievement of the above objective, the pupil :

1.1 recalls terms, facts, concepts; etc. in Physics.

### 2.0 OBJECTIVES : UNDERSTANDING

To develop an understanding of terms, facts, concepts, definitions, fundamental laws, principles and processes in the field of Physics.

Specifications :

To demonstrate the achievemen he above objective, the pupil :

2.1 gives illustrations of principles.

2.2 locates errors in the given statements, arrangement etc. and rectifies the same.

2.3 sees relationship between cause and effect.

2.4 classifies data and phenomenon as per criteria.

2.5 translates verbal statements into symbols and vice versa.

2.6 verifies facts, principles, etc.

2.7 distinguishes between related concepts.

2.8 gives explanations of the familiar phenomenon.

2.9 solves numerical problems involving physical principles.

3.0 OBJECTIVE : APPLICATION

To apply the knolwedge and understanding of Physics in unfamiliar situations.

Specifications :-

To demonstrate the achievement of the above objective, the pupil :

3.1 analyses the situation or the problem.

3.2 formulates hypotheses.

3.3 devises new experiments to test hypotheses.

3.4 establishes relationship between cause and effect, the known and the unknown.

3.5 makes certain predictions.

3.6 verifies predictions.

4.0 : OBJECTIVE : SKILL

To acquire skill (a) the practical aspects of handling apparatus, recording observations, and (b) drawing diagrams, graphs, etc.

Specifications :

To demonstrate the achievement of the above objective, the pupil :

(a) Manipulative Skills

4.1 checks the working condition of apparatus and equipment.

4.2 rectifies faults in apparatus if possible, under laboratory conditions.

4.3 sketches the arrangements of apparatus (if necessary) at the outset.

4.4 sets up the apparatus in a planned manner.

4.5 uses equipments within their limitations and with proper precautions.

4.6 records relevant readings accurately and systematically.

4.7 performs experiments with reasonable speed and neatness.

4.8 improvises instruments for various purposes.

4.9 carries out simple original projects.

(b) Drawing Skills

4.10 draws neat sketches and diagrams to scale.

4.11 draws diagrams according to the actual arrangement of the apparatus.

4.12 select proper scales for graphs.

4.13 draws neat free-hand graphs.

4.14 records and presents data in tables, charts, graphs etc.

4.15 lables the parts of a diagram accurately.

## UNIT : 1

## PHYSICAL WORLD AND MEASUREMENTS

# DESIGN OF UNIT TEST

| | | |
|---|---|---|
| Subject | : | Physics |
| Unit | : | Physical World and Measurement |
| Class | : | XI |
| Time | : | 30 minutes |
| Marks | : | 25 |

## I. Weightage to Objectives :

| Objective | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of Marks | 44 | 32 | 24 | | 100 |
| Marks | 11 | 8 | 6 | | 25 |

## II. Weightage to Form of Questions :

| Form of Questions | E | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 4 | 4 | 14 |
| Marks allotted | 5+4 | 8 | 4 | 4 | 25 |
| Estimated Time | 8+6 | 8 | 4 | 4 | 30 |

## III. Weightage to Content :

| | Sub-Unit | Marks |
|---|---|---|
| 1. | System of units-base and derived units | 8 |
| 2. | Length, Mass & Time and their measurements | 4 |
| 3. | Dimensions and dimensional analysis | 8 |
| 4. | Accuracy, precision of instruments & errors in measurement. | 5 |
| | Total : | 25 |

## IV. Difficulty level :

Difficult : 25% marks.
Average : 50% marks.
Easy : 25% marks.

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Abbreviations : K (Knowledge), U (Understanding), A (Application), S (Skill), E (Essay type), SA (Short Answer type), VSA (Very short answer type), O (Objective type)

# BLUE PRINT

SUBJECT : Physics — Class : XI

UNIT : Physical World and Measurement — MAXIMUM MARKS : 25 Time: 30 minutes

| Sl.No. | OBJECTIVES → Units or Sub-Units / Form of Questions ↓ | KNOWLEDGE |  |  |  | UNDERSTANDING |  |  |  | APLICATION |  | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | E | SA | VSA | O | E | SA | VSA | O | SA | VSA |  |
| 1. | System of units, base & derived units. |  |  |  |  | 4(1) |  |  |  |  |  | 4(1) |
| 2. | Length, Mass & Time and their measurements |  | 2(1) | 1(1) | 2(2) |  |  |  |  | 2(1) | 1(1) | 8(6) |
| 3. | Dimensions and Dimensional analysis | 5(1) | 4(2) | 1(1) | 1(1) |  | 2(1) |  |  |  |  | 8(3) |
| 4. | Accuracy, precision of instruments & errors in measurement |  | 2(1) |  |  |  |  | 1(1) | 1(1) |  | 1(1) | 5(4) |
|  | SUB TOTALS | 5(1) | 4(2) | 1(1) | 3(3) | 4(1) | 2(1) | 1(1) | 1(1) | 2(1) | 2(2) | 25(14) |
|  | TOTALS |  |  | 13(7) |  |  | 8(4) |  |  | 4(3) |  | 25(14) |

Notes : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.

## UNIT TEST

Unit : Physical World and Measurement　　Time : 30 minutes
Class : XI　　Marks : 25

Instructions :

I. All questions are compulsory.

II. Question 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A, B, C or D that corresponds to the correct answer along with its question number.

Question 5-8 are very short answer type to be answered with a word/numeral or a line.

III. Question 9-12 are short answer type questions of 2 marks each. The answers should be of about 40 words. Question 13 in a problem of 4 marks.

IV. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

QUESTIONS :

① Light year is an unit of

A. time,
B. distance,
C. intensity of light,
D. velocity of light,

② Which pair of the following physical quantities has identical dimensions ?

A. Work and power

B. Power and Energy

C. Work and Energy

D. Force and Impulse

3. Which one of the following is NOT a unit of time ?

A. Lunar month

B. Leap year

C. Parallactic second

D. Solar day

④ Percentage error in the measurement of mass and velocity are 2% and 3% respectively. Percentage error in the measurement of kinetic energy will be

A. 11%

B. 8%

C. 7%

D. 5%

⑤ Write the unit of gravitational mass in S.I.&GCS systems.

⑥ Each side of a cube is 1.5m. Calculate the volume of the cube up to the correct number of significant figures.

7. Time period of a simple pendulum is 3.2s. Write separately the reliable and uncertain figures in the time period.

8. Size of a mole is of the order of $10^{-9}$m. What will be its size in fermi ? $1F = 10^{-2}m$

9. Smallest division in a foot-rule is ½ mm and the slide calliper has 10 divisions in 1 mm. Calculate the instrumental error in both foot-rule & slide calliper.

10. Describe with a diagram how angular measurements help in determining the sizes of the astronomical objects ?

11. Dimensionally check the accuracy of the equation $s = ut + (1/2)at^2$ where the symbols have their usual meaning.

12. The distance between earth and sun is $1.5 \times 10^{11}$m. Calculate this distance in terms of (i) fermi (ii) angstrom.

13. Calculate the units of length, mass and time by taking the units of force, velocity and energy as 10 N, 10 $ms^{-1}$ and 500 Joules respectively.

14. What are the dimensions of a physical quality ? State the principle of homogeniety of dimensions. Briefly outline three applications of this principle.

## SCORING KEY

| Q.No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Key | B | C | C | B |
| Marks | 1 | 1 | 1 | 1 |

## MARKING SCHEME

| Q.No. | Form | Value points | Marks | Total |
|---|---|---|---|---|
| 5. | VSA | kg & g | ½ + ½ | 1 |
| 6. | " | $3.4\ m^3$ | 1 | 1 |
| 7. | " | reliable figure 3 | ½ | 1 |
| | | uncertain fig. 2 | ½ | |
| 8 | " | $10^6$ f | 1 | 1 |
| 9. | SA | Instrumental error (foot rule) .25mm | 1 | 2 |
| | | Instrument error slide calliper .05 mm. | 1 | |
| 10. | " | Diagram | ½ | 2 |
| | | Description | 1½ | |
| 11. | " | Dimensions of s,u,t & a | 1 | 2 |
| | | Checking by principle of homogeneity | 1 | |

Contd...

| Q.No. | Form | Value points | Marks | Total |
|---|---|---|---|---|
| 12. | | In fermi | 1 | 2 |
| | | In angstrom | 1 | |
| 13. | Problem | Correct dimensional formula of energy, force and velocity | 1 | 4 |
| | | Calculating units of length, mass & time units | 1+1+1 | |
| 14. | LA | Dimensions of a physical quantity. | 1 | 5 |
| | | Principle of homogeneity | 1 | |
| | | Applications (any three) | 3 | |
| | | | Total | 25 |

## QUESTION -WISE ANALYSIS

| S. No. | Objective | Specification | Sub-Unit | Form of Question | Marks Allotted | Estimated Time (minutes) | Estimated Difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Length | O | 1 | 1 | Easy |
| 2. | K | Recalls | Dimensions | " | 1 | 1 | Average |
| 3. | K | " | Time | " | 1 | 1 | Average |
| 4. | U | Calculates | Accuracy Precision & Errors etc. | " | 1 | 1 | Average |
| 5. | K | Recalls | - Mass | VSA | 1 | 1 | Easy |
| 6. | U | Calculates | Accuracy precision etc. | " | 1 | 1 | Difficult |
| 7. | A | Interprets | " | " | 1 | 1 | Average |
| 8. | A | Solves | Length | " | 1 | 1 | Difficult |
| 9. | K | Recalls | Accuracy etc. | SA | 2 | 2 | Average |
| 10. | K | Describes | length | " | 2 | 2 | Easy |
| 11. | U | Calculates | Dimensions | " | 2 | 2 | Easy |
| 12. | A | " | Length | " | 2 | 2 | Easy |
| 13. | U | " | Units | problem | 4 | 6 | Difficult |
| 14. | K | Recalls | Dimensions & Dimensional Analysis | LA | 5 | 8 | Average |

UNIT : 2

# DESCRIPTION OF MOTION IN ONE DIMENSION

# DESIGN
# OF
# UNIT TEST

Subject : Physics
Unit : Description of Motion in one Dimension
Class : XI
Time : 30 minutes
Marks : 25

## I. Weightage to objectives :

| Objective | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 16 | 56 | 12 | 16 | 100 |
| Marks | 4 | 14 | 3 | 4 | 25 |

## II. Weightage to Form of Questions :

| Forms of Questions | E | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 2 | 4 | 2 | 6 | 14 |
| Marks Alloted | 5+4 | 8 | 2 | 6 | 25 |
| Estimated Time (minutes) | 14 | 8 | 2 | 6 | 30 |

## III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Motion in a straight line | 3 |
| 2. | Uniform motion | 7 |
| 3. | Constant acceleration | 8 |
| 4. | Relation between position & Velocity | 4 |
| 5. | Acceleration in one dimensional motion | 3 |
| | Total : | 25 |

## IV. Difficulty level :

Difficult : 20% marks.
Average : 52% marks.
Easy : 28% marks.

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Abbreviations : K (Knowledge), U (Understanding), A (Application), S (Skill), E (Essay type), SA (Short Answer type), VSA (Very Short Answer type), O (Objective type).

# BLUE PRINT

Subject : Physics Class : XI

Unit : Motion in One Dimension Maximum marks: 25 Time : 30 minutes

| Sl. No. | OBJECTIVES | KNOWLEDGE | | | | UNDER-STANDING | | | | APPLICATIONSkil | | | | SKILL | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sub-Units / Forms of Questions | E | SA | VSA | O | E | SA | VSA | O | E | SA | VSA | O | E | SA | |
| 1. | Motion in a straight line | | | | | | 2(1) | | | | | | 1(1) | | | 3(2) |
| 2. | Uniform motion | | | | 1(1) | 2(1) | 2(1) | | | | | | | 2(-) | | 7(3) |
| 3. | Constant acceleration | | | 1(1) | | 5(1) | | 1(1) | | 1(1) | | | | | | 8(4) |
| 4. | Relation between position & velocity | | | | | | | | | 1(1) | | | 1(1) | 2(1) | | 4(3) |
| 5. | Acceleration in one dimensional motion | | 2(1) | | | | | | | | | | 1(1) | | | 3(2) |
| | SUB TOTALS | | 2(1) | 1(1) | 1(1) | 7(2) | 4(2) | 1(1) | | 2(1) | | | 3(3) | 4(1) | | 25(14) |
| | TOTALS | 4(3) | | | | 14(7) | | | | 3(3) | | | | 4(1) | | 25(14) |

Note : Figures within brackets indicate the number of questions and figures outside the brack
indicate marks. *Denotes that marks have been combined to form one question.

| Summary : | | | |
|---|---|---|---|
| Essay (E) | No. 2 | Marks | 9 |
| Short answer (SA) | No. 4 | Marks | 8 |
| Very short answer (VSA) | No. 2 | Marks | 2 |
| Objective (O) | No. 6 | Marks | 6 |

## UNIT TEST

Unit : Motion in One Dimension
Class : XI
Marks : 25
Time : 30 minutes

**Instructions :-**

I. All questions are compulsory.

II. Questions 1 to 6 are multiple choice type having 1 mark each. For each question four alternative answers are provided out of which ONLY ONE is correct. Write in the answer sheet A, B, C, or D that corresponds to the correct answer along with its question number.

III. Questions 7 and 8 are very short answer type of one mark each and must be answered in a sentence or two.

IV. Questions 9 to 12 are short answer type of 2 marks each. The answer should not exceed 40 words each.

V. Questions 13 and 14 are long answer type of 4 and 5 ma to be answered within 100 words each.

**QUESTIONS :-**

1. A moving body covers a distance directly proportional to the cube of the time elapsed. The magnitude of the acceleration of the body is

A. increasing.

B. decreasing.

C. zero.

D. constant.

②

The acceleration of a moving body is given by

A. slope of the velocity – time graph.

B. slope of the distance – time graph.

C. area under the velocity – time graph.

D. area under the distance – time graph.

3. A body is projected vertically upwards with an initial velocity 'V'. The maximum height obtained is

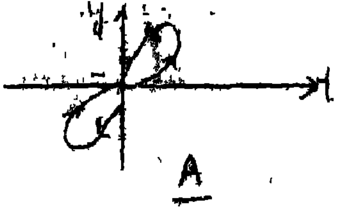
A. $\frac{V^2}{g}$

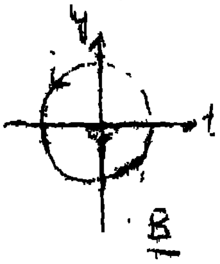
B. $\frac{V^2}{\sqrt{2g}}$

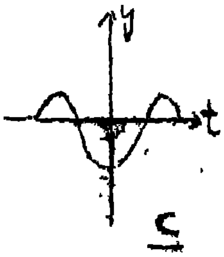
C. $\frac{2V^2}{2g}$

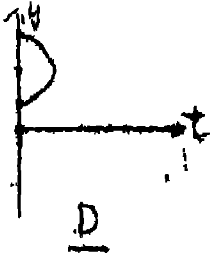
D. $\frac{\sqrt{2V}}{g}$

4. Which of the following graphs represents motion of a particle ?

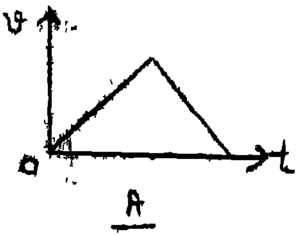


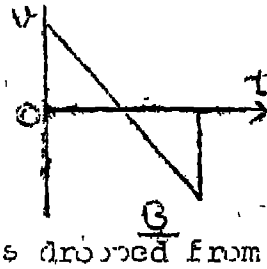


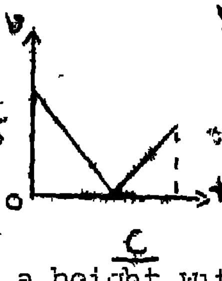


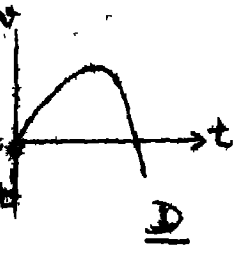


5. A body is thrown vertically upwards with a velocity 'V' from the surface of the earth. The Velocity - time graph for the body is given by









6. A hollow sphere is dropped from a height with an acceleration 'a'. The sphere is now filled with water so tha its mass becomes double and is again dropped from the sa height. The sphere will now fall with an acceleration (neglecting air resistance)

A. a/2

B. a

C. $\sqrt{2}a$

D. 2a

7. Define constant acceleration. How it depends upon time ?

8. Is it possible to have zero velocity and positive acceleration at a given time ? Illustrate with an example.

9. Define instantaneous and average accelerations. Show them graphically.

10. The co-ordinates of a point moving along x-axiz changes with time according to the equation $x = 3 + 5t + 3t^2$ (x in m and t in s ). Calculate its velocity and accel after 20 seconds.

11. Calculate the distance covered in the first 3 seconds, if the velocity of a particle starting from rest increases with an acceleration of 2 m $s^{-2}$.

12. A woman starts from her home at 9.00 A.M., walks with a speed of 5 km/h on a straight road up to her office 2.50 away, works in the office upto 5:00 P.M. and returns straight home by an auto having a speed of 25 km/h. Cho suitable scale and plot the distance - time graph of he motion.

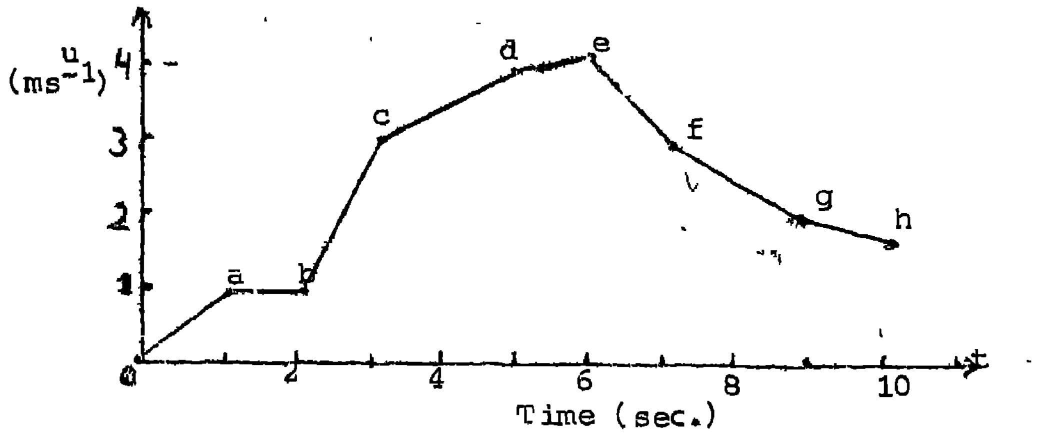
13. A train having uniform motion, covers 480 m every minute

    (i) Represent this motion graphically.

    (ii) Draw a velocity - time graph for this motion.

    (iii) Calculate the distance covered between 2nd and 6th second from graph.

14. The velocity - time graph of the motion of a particle is shown below. Calculate the average velocity and average acceleration at the end of 5 s and 10 s respect During which interval the acceleration is maximum & maximum ?



## SCORING KEY

| Q.No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Key | A | A | B | C | B | B |

## MARKING SCHEME

| S.No. | Form | | Value Points | Marks | Total |
|---|---|---|---|---|---|
| 7 | VSA | (i) | Definition of constant acceleration | ½ | 1 |
| | | (ii) | Its dependence | ½ | |
| 8 | " | (i) | Yes | ½ | |
| | | (ii) | In projectile motion at maximum height velocity is zero, acceleration is positive | ½ | 1 |
| 9 | SA | (i) | Two definitions | ½ + ½ | |
| | | (ii) | Two graphs | ½ + ½ | 2 |
| 10. | " | (i) | $v = \frac{dx}{dt} = 125\ ms^{-1}$ | 1 | |
| | | (ii) | $a = \frac{dv}{dt} = 6\ ms^{-2}$ | 1 | 2 |
| 11. | " | (i) | $v = at = 6\ ms^{-1}$ | 1 | 2 |
| | | (ii) | $s = \frac{v^2 - u^2}{2a} = 9m$ | 1 | |
| 12. | " | (i) | Choosing proper Scale | 1 | |
| | | (ii) | Drawing distance-time graph | 1 | 2 |

| | | | | |
|---|---|---|---|---|
| 13. | SA | (i) | Representation of motion | 1 |
| | | (ii) | Velocity-time graph | 1 |
| | | (iii) | Calculation of distance from graph | 2 |
| 14. | LA | (i) | Average velocity after 5 s $=2.1\ ms^{-1}$ | 1 |
| | | (ii) | Average velocity after 10s $= 2.5\ ms^{-1}$ | 1 |
| | | (iii) | Average acceleration after 5s $= 0.8\ ms^{-2}$ | 1 |
| | | (iv) | Average acceleration after 10s $=0.2\ ms^{-2}$ | 1 |
| | | (v) | Acceleration is maximum between points b and c | $\frac{1}{2}$ |
| | | (vi) | Acceleration is minimum between a and b | $\frac{1}{2}$ |

## QUESTION-WISE ANALYSIS

| S. No. | Objective | Specidification | Sub-Unit | Form of question | Marks Allotted | Estimatime | Estimated difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Uniform Motion | O | 1 | 1 | Average |
| 2. | U | Identifies | Constant acceleration | " | 1 | 1 | " |
| 3. | U | Calculates | Relation between position and velocity | " | 1 | 1 | " |
| 4. | A | Analyses | Motion in straight line | " | 1 | 1 | Difficult |
| 5. | A | Interprets | Relation between position and velocity | " | 1 | 1 | Average |
| 6. | A | Analyses | Accelertion in one dimensional motion | " | 1 | 1 | " |
| 7. | K | Recalls | Constant accelration | VSA | 1 | 1 | Easy |
| 8. | U | Illustrates | " | " | 1 | 1 | Average |
| 9. | K | Recalls | Acceleration in one motion | SA | 2 | 2 | Easy |
| 10. | U | Calculates | Motion in a straight line | " | 2 | 2 | " |
| 11. | U | Calculates | Uniform Motion | " | 2 | 2 | " |
| 12. | A | Interprets | Relation between position and velocity | " | 2 | 2 | Average |
| 13. | U | Calculates | Uniform motion | LA | 4 | 6 | " |
| 14. | U | Calculates | Constant acceleration | LA | 5 | 8 | Difficult |

## UNIT : 3

# DESCRIPTION OF MOTION IN TWO AND THREE DIMENSIONS

# DESIGN
# OF
# UNIT TEST

| | | |
|---|---|---|
| Subject | : | Physics |
| Unit | : | Description of Motion in Two and Three Dimensions. |
| Class | : | XI |
| Time | : | 30 minutes |
| Marks | : | 25 |

(i) Weightage to objectives :

| Objective | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of Marks | 36 | 48 | 16 | - | 100 |
| Marks | 9 | 12 | 4 | - | 25 |

(ii) Weightage to form of Questions :

| Form of Questions | K | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 2 | 4 | 2 | 6 | 14 |
| Marks Alloted | 9 | 8 | 2 | 6 | 25 |
| Estimated Time (minutes) | 14 | 8 | 2 | 6 | 30 |

(iii) Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1.. | Vectors | 5 |
| 2. | Components of vectors in a plane | 2 |
| 3. | Motion in Two Dimensions | 7 |
| 4. | Circular Motion | 5 |
| 5. | Motion on a general path in a plane | 2 |
| 6. | Motion in Three dimensional space | 4 |
| | TOTAL | 25 |

(iv) Difficulty level

| | | |
|---|---|---|
| Difficult | : | 16% marks. |
| Average | : | 56% marks. |
| Easy | : | 28% marks. |

Abbreviations : K(Knowledge), U(Understanding), A(Applicatio
S(Skill) E(Essay type), SA(ShortAnswer type)
VSA(Very Short Answer type), O(Objective ty

## BLUE PRINT

**Subject:** Physics　　Class : XI

**Units:** Description of Motion in Two and Three Dimensions Maximum Marks: 25 Time : 30 minutes

| Sl. No. | OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Units Form of question | E | SA | VSA | O | E | SA | VSA | O | E | SA | VSA | O | |
| 1. | Vectors | | | | | | 2(1) | 1(1) | | | 2(1) | | | 5(3) |
| 2. | Components of a vector in a plane | | 2(1) | | | | | | | | | | | 2(1) |
| 3. | Motion in Two Dimension | 5(1) | | | | | | | 1(1) | | | | 1(1) | 7(3) |
| 4. | Circular motion | | | | | 4(1) | | | 1(1) | | | | | 5(2) |
| 5. | Motion on a general path in a plane | | | | | | 2(1) | | | | | | | 2(1) |
| 6. | Motion in Three Dimensional space. | | | 1(1) | 1(1) | | | | 1(1) | | | | 1(1) | 4(4) |
| | SUB TOTALS | 5(1) | 2(1) | 1(1) | 1(1) | 4(1) | 4(2) | 1(1) | 3(3) | | 2(1) | | 2(2) | 25(14) |
| | TOTALS | | 9(4) | | | | 12(7) | | | | 4(3) | | | 25(14) |

Notes: Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.

| Summary: | | | |
|---|---|---|---|
| | Essay (E) | No. ....2...... | Marks ....9....... |
| | Short answer (SA) | No. ....4...... | Marks. ...8....... |
| | Very Short Answer (VSA) | No. ....2..... | Marks. ...2....... |
| | Objective (0) | No. ....6.... | Marks. ...6....... |

## UNIT TEST

Unit : Motion in Two and Threee Dimen
Class : XI
Marks : 25
Time : 80 minutes

**Instructions** :-

1. All questions are compulsory.
2. Questions 1 to 6 are multiple choice type having 1 mark each. For each question four alternative answers are provided out of which ONLYONE is correct. Write in the answer sheet A, B, C, or D that corresponds to the corre answer along with its question number.
3. Question 7 and 8 are very short answer type of one mar each and must be answered in a sentence or two.
4. Questions 9 to 12 are short answer type of 2 marks each The answer should exceed 40 words each.
5. Questions 13 and 14 are long answer type of 4 and 5 ma to be answered within 100 words each.

**QUESTIONS** :-

1. Two bodies projected with same velocity at angles $\pi/3$ and $\pi/6$ have range $R_1$ and $R_2$ respectively, then

   A. $2R_1 = R_2$

   B. $R_1 = R_2$

   C. $R_1 = 2R_2$

   D. $R_1 = 3R_2$

2. The motion of a body in two dimensional space wi respect to an arbitrarily-chosen origin is repre by

   A. $\vec{r}(t) = x(\theta)\hat{i} + y(\theta)\hat{j}$

   B. $\vec{r}(t) = \vec{x}(t)\hat{i} + \vec{y}(t)\hat{j}$

   C. $\vec{r}(t) = x(t)\hat{i} + y(t)\hat{j}$

   D. $\vec{r}(t) = \hat{x}(t) + \hat{y}(t)$

3. A body moving with constant stood in a horigental circle has acceleration

A. equal to zero

B. along tangent to the circle.

C. along redius away from centre.

D. along radius towards centre.

4. Out of the following which not on can correspond to an un-accelerated motion in three dimentional space?

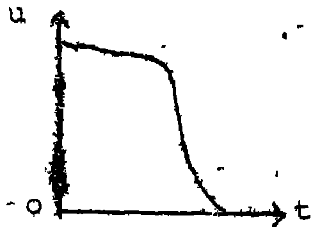
A. straight line motion

B. circular motion

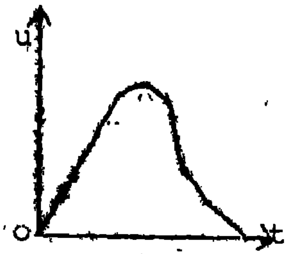
C. spiral motion

D. Zig-zag motion

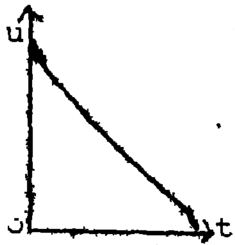
5. A paratrooper is dropped from an aeroplane. After sometime his parachute opens up and he reaches the ground with a small speed. The speed (v) verus time (time) graph of his motion will look like



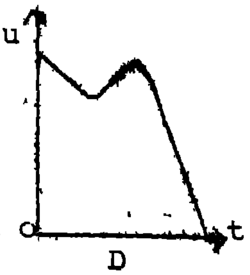
A



B

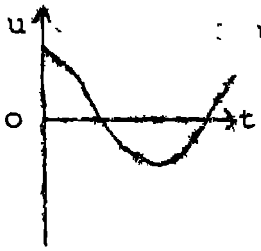


C

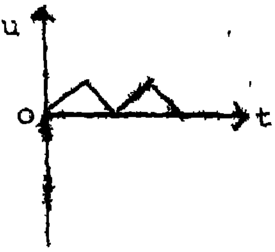


D

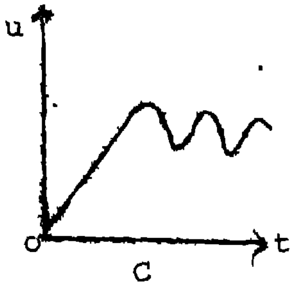
6. The figures below show velocity versus time graph. Which of them CANNOT be realired in practice?



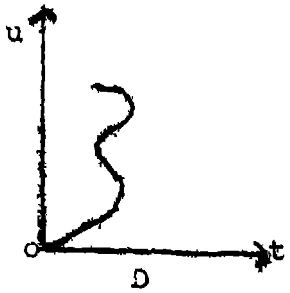
A



B



C



D

7. The acceleration of a particle is represented by the equation

$$\vec{a}(t) = a_x(t)\ \hat{i} + a_y(t)\ \hat{j} + a_z(t)\ \hat{k}$$

Write the value of $\vec{a}(t)$ in the different form.

8. Three vectors $\vec{V}_1$, $\vec{V}_2$, $\vec{V}_3$ are such that their resultan vector sum is equal to zero. Is the following relation true or false? Give reason for your answer :

$$\vec{V}_1 \times \vec{V}_2 = \vec{V}_2 \times \vec{V}_3$$

9. Show that the two rectangular components of a given vecto can never be greater than the vector itself in magnitude.

10. The magnitude of vector sum of two vectors in equal to the magnitude of their vector difference. What is the angle between two vectors?

11. A body moving in a plane has an acceleration 'a' at any instant. When are tangential and normal component of acceleration zero separately.

12. What is the angle between the vectors.

$(\hat{i} - \hat{j})$ and $(\hat{i} + 3\hat{j})$ ?

13. Calculate the angular velocity and linear velocity of a 3 cm. long minute hand of a clock. Is its acceleratio vector constant? Calculate its magnitude.

14. A body describes a circle of radius 'r' with uniform speed 'V'. Derive an expression for the centripetal force acti on the body and show that it is always directed toward centre along the radius.

## SCORING KEY

| Q. No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Key | B | C | D | A | B | D |
| Marks | 1 | 1 | 1 | 1 | 1 | 1 |

## MARKING SCHEME

| Q. No. | Form | | Value points | Marks | Total Marks |
|---|---|---|---|---|---|
| 7. | VSA | | Correct equation | 1 | 1 |
| 8. | " | (i) | True | ½ | |
| | | (ii) | Because vectors are co-planner | ½ | 1 |
| 9. | SA | (i) | Two rectangular components | ½ + ½ | |
| | | (ii) | The maximum values of sin and cos cannotbe more than 1 | 1 | 2 |
| 10. | " | (i) | Formula for magnitude of vector sum | ½ | |
| | | (ii) | Formula for the magnitude of vector difference | ½ | |
| | | (iii) | Equating (i) & (ii) | ½ | |
| | | (iv) | Calculation of $\theta (=90^\circ)$ | ½ | 2 |
| 11. | " | (i) | Tangential component is zero when speed is constant | 1 | |
| | | (ii) | Normal component is zero when motion is along a straight path. | 1 | 2 |

| | | | | |
|---|---|---|---|---|
| 12. | " | (i) Angle of ($\hat{i}-\hat{j}$) with x-axis is 45° | ½ | |
| | | (ii) Angle of ($\hat{i}+3\hat{j}$) with the x-axis is 60° | ½ | |
| | | (iii) Angle between the vectors is 105° | 1 | 2 |
| 13. | Problem | (i) Angular velocity= 1.74 x 10-3 rad $s^{-1}$ | 1 | |
| | | (ii) Linear velcity= 5.21 x 10-3 cms $s^{-1}$ | 1 | |
| | | (iii) Acceleration vector is not constant, it changes direction contineously. | 1 | |
| | | (iv) Acceleration = $9.08 \times 10^{-6}$ cm $s^{-2}$ | 1 | 4 |
| 14. | LA | (i) Representation of radius and velcoty as vectors $\vec{r}$ and $\vec{V}$ | 1 | |
| | | (ii) Speed is ωR | 1 | |
| | | (iii) Calculation of acceleration | 2 | |
| | | (iv) Showing of direction vector acting along the radius and towards and centre | 1 | 5 |

## QUESTION - WISE ANALYSIS

| S. No. | Objective | Specification | Sub-Unit | Form of Question | Marks Alloted | Esti-Time (minutes) | Estimated Difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Motion in Two Dimension | O | 1 | 1 | Easy |
| 2. | U | Identifies | Motin in Dimension | " | 1 | " | Easy |
| 3. | U | " | Circular motion | " | 1 | " | Average |
| 4. | U | " | Motion in Three Dimensional space. | " | 1 | " | Average |
| 5. | A | Analyses | " | " | 1 | " | Difficult |
| 6. | A | " | Motion in Two Dimension | " | 1 | " | " |
| 7. | K | Recalls | Motion in Three Dimension space | V | 1 | " | Average |
| 8. | U | Explains | Vectors | " | 1 | " | " |
| 9. | K | Recalls | Vectors | SA | 2 | 2 | Average |
| 10. | U | Calculates | Components of vectors | " | 2 | " | " |
| 11. | A | Explains | Motion on a general path | " | 2 | " | Average |
| 12. | A | Calculates | Vectors | " | 2 | " | Difficult |
| 13. | U | " | Circular Motion | LA | 4 | 6 | Average |
| 14. | K | Recalls | Motion in Two Dimension | " | 5 | 8 | Easy |

# DESIGN
# OF
# UNIT TEST

Subject : Physics
Unit : Laws of Motion
Class : XI
Time : 30 minutes
Marks : 25

## I. Weightage to Objectives :

| Objective | K | U | A | Total |
|---|---|---|---|---|
| Percentage of Marks | 36% | 32% | 32% | 100% |
| Marks | 09 | 08 | 08 | 25 |

## II. Weightage to Form of Questions :

| Forms of Questions | E | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 4 | 4 | 14 |
| Marks Alloted | 5+4 | 8 | 4 | 4 | 25 |
| Estimated Time (minutes) | 9+5 | 8 | 4 | 4 | 30 |

## III Weightage to Content :-

| | Sub-Units | Marks |
|---|---|---|
| 1. | Force, Inertia and First law of motion | 5 |
| 2. | Second law of motion | 6 |
| 3. | Third law of motion | 5 |
| 4. | Equilibrium | 1 |
| 5. | Friction | 6 |
| 6. | Lubrication | 1 |
| 7. | Inertial and Accelerated frames | 1 |
| | Total | 25 |

---

## IV. Difficulty level :

| | |
|---|---|
| Difficult | 24% marks |
| Average | 36% marks |
| Easy | 40% marks |

---

Abbreviations : K(Knowledge), U(Understanding), A(Application), S(Skill, E (Essaytype), SA(Short Answertype), VSA (Very Short Answer type), O(Objective type).

# BLUE PRINT

Subject : Physics
Maximum Marks : 25
Class: XI
Time: 30 mts.

Unit: Laws of Motion

| Sl. No. | OBJECTIVE Sub-Units | Form of question | KNOWLEDGE E | SA | VSA | O | UNDERSTANDING E | SA | VSA | O | APPLICATION E | SA | VSA | O | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Force, inertia and First law of motion | | | 2(1) | | | | 2(1) | 1(1) | | | | | | 5(3) |
| 2. | Second law of motion | | | | | 1(1) | | 2(1) | | 1(1) | | 2(1) | | | 6(4) |
| 3. | Third law of motion | | | | | | | | | | 4(1) | | 1(1) | | 5(2) |
| 4. | Equilibrium | | | | | | | | | 1(1) | | | | | 1(1) |
| 5. | Friction | | 5(1) | | | | | | | | | | | 1(1) | 6(2) |
| 6. | Lubrication | | | | | | | | 1(1) | | | | | | 1(1) |
| 7. | Inertial and accelerated frames | | | | 1(1) | | | | | | | | | | 1(1) |
| | SUB TOTALS | | 5(1) | 2(1) | 1(1) | 1(1) | | 4(2) | 2(2) | 2(2) | 4(1) | 2(1) | 1(1) | 1(1) | 25(14) |
| | TOTALS | | 9(4) | | | | 8(6) | | | | 8(4) | | | | 25(14) |

Notes : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.

| Summary : | | | | |
|---|---|---|---|---|
| Essay (E) | No. | 1+1 | Marks | 5+4 |
| Short answer(SA) | No. | 4 | Marks | 8 |
| Very short - Answer(VSA) | No. | 4 | Marks | 4 |
| Objective (O) | No. | 4 | Marks | 4 |

## UNIT TEST

Unit : Laws of Motion
Class : XI

Time : 30 mts.
Marks : 25

INSTRUCTIONS :

I. All questions are compulsory.

II. Questions 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A, B, C or D that corresponds to the correct answer along with its question number. Questions 5-8 are very short answer type each to be answered within a line or two,

III. Questions 9-12 are short answer type questions of 2 marks each. The answer should be within 40 words each. Question 13 in a problem of 4 marks.

IV. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

QUESTIONS .

① The acceleration of a rocket just launched is

A. much more than g

B. equal to 2 g

C. equal to g

D. less than g

2. A fireman slides down a rope having a breaking strength of 7/8 of his weight. His acceleration is

A. zero

B. g/8

C. (7/8) g

D. g.

③ The net force acting on a body is never zero if the number of forces of different magnitudes acting upon it are

A. 5

B. 4

C. 3

D. 2

4. A force of 20 N is required to start sliding of a rectangular piece of wood on a bench. The coefficient of friction between wood and bench is 0.4. If a similar piece of wood is placed on the top of it, the force now required for sliding both will be

A. 8 N

B. 20 N

C. 40 N

D. 50 N

5. What is a fictitious force ? Give an example of such a force.

6. One has to pedal harder when starting a bicycle than when it is already running ?

7. Write two uses of purified and compressed air as lubricant.

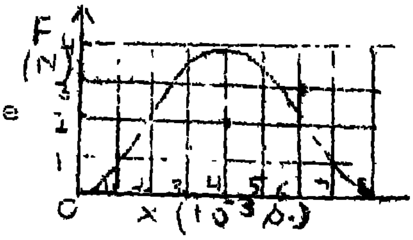
8. Explain why the velocity and acceleration of a rocket goes on increasing as it goes up in the space ?

9. State Newton's first law of motion and show that it gives the idea of inertia. Illustrate with one example each, inertia of rest and motion.

10. The velocity of a body of mass 1 kg changes from $5ms^{-1}$ east to $5ms^{-1}$ north. Find the change in momentum.

11. State two commonly known effects which occure when a force is applied on a body. Give example for each.

12. Refering to the graph which shows how the forces acting on the body during a collision varies with time. Estimate from the graph the total impulse and change in momentum.



13. An inclined plane making an angle of 30° with the horizontal has a frictionless pulley at the top. A 50 kg. block placed on the plane is connected to a freely hanging 20 kg. block by means of a cord passing over the pulley. Compute the distance the 20 kg. block will fall in 2 seconds starting from rest. (neglect friction).

14. Explain the origin of friction, state the laws of kinetic friction. Distinguish between static and kinetic frictions.

## SCORING KEY

| Q.No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Key | A | B | D | C |
| Marks | 1 | 1 | 1 | 1 |

## MARKING SCHEME

| Q.No. | Form | | Value Points | Marks | Total Mar |
|---|---|---|---|---|---|
| 5. | VSA | (i) | Definition | ½ | 1 |
| | | (ii) | Example | ½ | |
| 6. | " | | Explanation on the basis of inertia | 1 | 1 |
| 7. | " | (i) | Reduces friction | ½ | |
| | | (ii) | Carries away heat produced etc | ½ | 1 |
| 8. | " | (i) | Gravity decreases | ½ | |
| | | (ii) | Mass of the rocket also decreases | ½ | 1 |
| 9. | SA | (i) | Statement and idea of inertia | ½ + ½ | |
| | | (ii) | Two examples. | ½ + ½ | 2 |
| 10. | " | (i) | $\Delta v = 5\sqrt{2}\ ms^{-1}$ at 45° N-W direction | ½ + ½ | |
| | | (ii) | $p = 5\sqrt{2}$ Kg $ms^{-1}$ at 45° N-W direction | ½ + ½ | 2 |
| 11. | " | (i) | State of rest/motion changes and sometimes deformation in shape | ½ + ½ | |
| | | (ii) | Example of each | ½ + ½ | 2 |
| 12. | " | (i) | Number of squares | ½ | |
| | | (ii) | Total area under curve | 1 | |
| | | (iii) | Change in momentum | ½ | 2 |
| 13. | Problem | (i) | Correct diagram with forces | 1 | |
| | | (ii) | Two equations of motion | 1 | |
| | | (iii) | Calculation of tension T=176.4 N | 1 | |
| | | | Cal. of distance (1.96 m.) | 1 | 4 |
| 14. | E | (i) | Explanation of origin | 1 | |
| | | (ii) | Two laws of friction | 2 | |
| | | (iii) | Distinction (two points) | 2 | 5 |

## QUESTION-WISE ANALYSIS

| Sl. No. | Objective | Specification | Sub-Unit | Form of question | Marks Alloted | Estimated Time | Estimated Difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Second Law | O | 1 | 1 | Easy |
| 2. | U | Calculates | " | " | 1 | 1 | Average |
| 3. | U | " | Equilibrium | " | 1 | 1 | " |
| 4. | A | Analyses | Friction | " | 1 | 1 | " |
| 5. | K | Recalls | Inertial and Accelerated frames | VSA | 1 | 1 | Easy |
| 6. | U | Corelates | Force Inertia etc. | " | 1 | 1 | " |
| 7. | U | Explains | Lubrication | " | 1 | 1 | Average |
| 8. | A | " | Third law of motion | " | 1 | 1 | " |
| 9. | K | Recalls | Force Inertia etc, | SA | 2 | 2 | Easy |
| 10. | U | Solves | Second law of motion | " | 2 | 2 | Average |
| 11. | " | Examplifies | Force, Inertia etc. | " | 2 | 2 | " |
| 12. | A | Estimates | Second law of motion | " | 2 | 2 | " |
| 13. | A | Solves | Third law of motion | Numerical | 4 | 5 | " |
| 14. | K | Recalls | Friction | LA | 5 | 9 | Easy |

# UNIT : 5

# WORK, ENERGY AND POWER

# DESIGN
# OF
# UNIT TEST

| | | |
|---|---|---|
| Subject | : | Physics |
| Unit | : | Work Energy & Power |
| Class | : | XI |
| Time | : | 30 mts. |
| Marks | : | 25 marks. |

## I Weightage to Objectives :

| Objectives | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 36 | 32 | 32 | | 100 |
| Marks | 09 | 08 | 08 | | 25 |

## II. Weightage to Form of Questions :

| Forms of Question | E | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 4 | 4 | 14 |
| Marks Allotted | 5+4 | 8 | 4 | 4 | 25 |
| Estimated Time | 8+6 | 8 | 4 | 4 | 30 mts. |

## III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Work | 7 |
| 2. | Kinetic Energy | 2 |
| 3. | Potential Energy | 3 |
| 4. | Power | 2 |
| 5. | Collisions | 6 |
| 6. | Forms of Energy | 2 |
| 7. | Conservation of Energy | 3 |
| | Total: | 25 |

6. Difficulty level : Difficult: 24% marks Average: 44% marks
Easy: 28% marks

---

Abbreviations :- K(Knowledge), U (Understanding), A(Application), S(Skill), E(Essay type), SA(Short Answer type), VSA(Very short Answer (Type), O (Objective Type). N (Numerical).

SUBJECT : Physics

CLASS : XI

UNIT : Work, Energy and Power

Maximum Marks 25

TIME : 30 mts.

| Sl.No. | OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | SKILL | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sub-Units / Form of questions | E | SA | VSA | O | E | SA | VSA | O | E | SA | VSA | O | E | SA | |
| 1. | Work | | | | 1(1) | | | | | (1) | 2(1) | | | | | 7(3) |
| 2. | Kinetic - Energy | | | | | | | 1(1) | | | | 1(1) | | | | 2(2) |
| 3. | P.E. Potential Energy | | | 1(1) | | | | 1(1) | | | | | 1(1) | | | 3(3) |
| 4. | Power | | 2(1) | | | | | | | | | | | | | 2(1) |
| 5* | Collisions | 5(1) | | | | | | | 1(1) | | | | | | | 6(2) |
| 6. | Forms of Energy | | | | | | 2(1) | | | | | | | | | 2(1) |
| 7. | Conservation of Energy | | | | | | 2(1) | | 1(1) | | | | | | | 3(2) |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | SUB-TOTALS | 5(1) | 2(1) | 1(1) | 1(1) | | 4(2) | 2(2) | 2(2) | 4(1) | 2(1) | 1(1) | 1(1) | | | 25(14) |
| | TOTALS | 9(4) | | | | 8(6) | | | | 8(-) | | | | | | 25(14) |

Notes : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.
* Denotes that marks have been combined to form one question.

| Summary: | | | | |
|---|---|---|---|---|
| Essay (E) | No. | 1+1 | Marks | 5+4 = 9 |
| Short Answer (SA) | No. | 4 | Marks | 8 |
| Very Short Answer (VSA) | No. | 4 | Marks | 4 |
| Objective (O) | No. | 4 | Marks | 4 |

## UNIT TEST

Unit : Work, Power and Energy
Class : XI

Time : 30 mts.
Marks : 25

INSTRUCTIONS :

1. All questions are compulsory.
2. Questions 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A, B, C, or D that corresponds to be correct answer along with its question number. Questions 5-8 are very short answer type each to be answered within a line or two.
3. Questions 9-12 are short answer type questions of 2 marks each. The answer should be within 40 words each. Question 13 is a problem of 4 marks.
4. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

QUESTIONS :

①. Kilo-watt-hour is the unit of :

A. Power

B. Work

C. Momentum

D. Time

2. At what displacement (in terms of amplitude 'a') will the K.E. of a simple pendulum be half of its total energy ?

A. .25a

B. .5a

C. .707a

D. a

3. If two balls hit and stick together which of the following quantity is conserved ?

   A. Kinetic Energy only

   B. Potential Energy only

   C. Momentum only

   D. Both Kinetic Energy and Momentum

4. A body thrown up rises maximum to a height of 100 m. which of the following is true when the body is at a height of 60m.

   A. K. Energy is more.

   B. P. Energy is more.

   C. Both are equal.

   D. Given data is inadequate.

5. Define a conservative force and give one example.

6. If the mass of a body is halved and its velocity doubled, how much will be its K.E. as compared to original K.E.?

7. The energy stored in a spring is U. How much is the energy stored when the compression on the spring in doubled ?

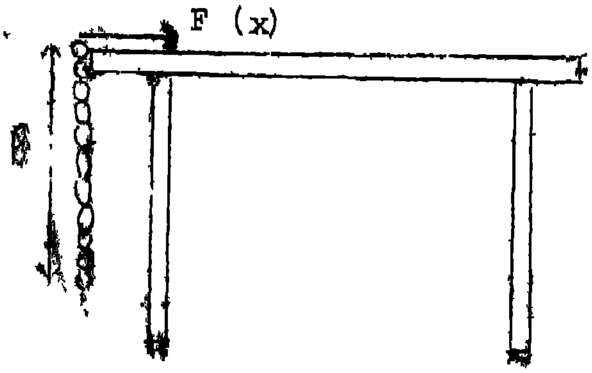
8. When a bullet is fired from a rifle it recoils. Which of the two has greater kinetic energy, bullet or gun and why ?

9. Define the terms : work and power. Mention their S.I. Units.

10. The P.E. and K.E. of a body of mass 2Kg at any point when projected up are 1200 J and 760 J respectively. Calculate how high will it go above the ground ?

11. Calculate the energy released in Mev when I gm of mass is completely annihilated.

12.



A flexible chain hanging by the side of a table is pulled along the surface of the table by a force F (x). Assuming that the top of the table is frictionless and total mass of the chain is "m" calculate work done to pull the whole chain on to the table.

13. The relation between displacement 'x' of a particle moving in one dimension against friction and time 't' is $t = \sqrt{x}+3$ where t is in s and x in m. Find work done against friction in 6 s. Mass of the particle is 5 gm.

14. What is an elastic collision ? K.E. Not in Inelastic and Momentum Conserve.

Consider the collision of one particle with another heavier particle at rest. Calculate their velocities after collision.

## MARKING SCHEME

| S.No. | Value Point/Key | Marks | Total marks |
|---|---|---|---|
| 1. | B | | 1 |
| 2. | C | | 1 |
| 3. | C | | 1 |
| 4. | A | | |
| 5. | Definition | ½ | 1 |
| | Example | ½ | |
| 6. | Double | 1 | 1 |
| 7. | Energy stored is four times now as $U = \frac{1}{2} k X^2$ | | |
| 8. | K. Energy of the bullet is greater because its velocity is much more. | ½ + ½ | 1 |
| 9. | Definitions | ½ + ½ | 2 |
| | S.I Units | ½ + ½ | |
| 10. | Total Energy mgh = K.E + P.E | 1 | |
| | Calculation of "h" = 98 m | 1 | 2 |
| 11. | Formula $E = mc^2$ | ½ | |
| | Calculation $E = 9\times10^{13}$ J | 1 | 2 |
| | $E = 5.625 \times 10^{26}$ Mev | ½ | |
| 12. | Expression for $F(x)$ | ½ | |
| | Calculation of $\Delta W$ | ½ | 2 |
| | Total work $W = \int \Delta W$ | 1 | |
| 13. | Displacement at zero and 6s | 1 | |
| | Expression for velocity | ½ | |
| | " " acceleration | ½ | |
| | " " " at 6s | ½ | 4 |
| | Force | ½ | |
| | Work done with units | 1 | |
| 14. | Definition of elastic collision. | 1 | |
| | Equation for momentum conservation | 1 | 5 |
| | " " " energy Conservation | 1 | |
| | Solving for velocities $V_1$ & $V_2$ | 2 | |

## QUESTION-WISE ANALYSIS

SUBJECT : PHYSICS UNIT Work, Power & Energy

Class : XI M.M. 25 Time 30

| Q. | Objective | Specification | Sub-Unit | Form of question | Marks Allotted | Estimated Time (mts.) | Estimated Difficult level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Work | OT | 1 | 1 | Average |
| 2. | U | Selects | Conservation of Enery | OT | 1 | 1 | Easy |
| 3. | U | Selects | Collisions | OT | 1 | 1 | Easy |
| 4. | A | Analyses | P. Energy | OT | 1 | 1 | Average |
| 5. | K | Recalls | P. Energy | VSA | 1 | 1 | Easy |
| 6. | U | Compares | K. Energy | VSA | 1 | 1 | Average |
| 7. | U | Calculates | P. Energy | VSA | 1 | 1 | Average |
| 8. | A | Compares | K. Energy | VSA | 1 | 1 | Average |
| 9. | K | Recalls | Power | SA | 2 | 2 | Easy |
| 10. | U | Calculates | Conservation of Energy | SA | 2 | 2 | Average |
| 11. | U | Calculates | Forms of Energy | SA | 2 | 2 | Easy |
| 12. | A | Analyses | Work | SA | 2 | 2 | Difficult |
| 13. | A | Inferes | Work | Numerical | 4 | 6 | Difficult |
| 14. | K | Recalls | Collisions | E | 5 | 8 | Average |

## UNIT : 6

# CENTRE OF MASS, RIGID BODIES, ROTATIONAL MOTION

## DESIGN

## UNIT TEST

Subject: Physics

Unit : Centre of Mass, Rigid bodies & Rotational Motion

Class : XI

Time : 30 minutes

Marks : 25

I. Weightage to Objectives :

| Objectives | K | U | A | S | Total |
|---|---|---|---|---|---|
| | 32% | 44% | 24% | - | 100% |
| Percentage of Marks | 8 | 11 | 6 | - | 25 |

II. Weigntage to Form of Questions :

| Forms of Questions | E/N | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of. Questions | 2 | 4 | 4 | 4 | 14 |
| Marks Allotted | 5+4 | 8 | 4 | 4 | 25 |
| Estimated Time | 14 | 8 | 4 | 4 | 30 |

III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Centre of Mass | 3 |
| 2. | Circular motion | 6 |
| 3. | Newton Laws for finite bodies | 1 |
| 4. | Torque and angular momentum | 7 |
| 5. | Moment of Inertia | 8 |
| | Total: | 25 |

IV. Difficulty level : Difficult : 40% marks
Average 52% marks
Easy 8% marks

Abbreviations : K (Knowledge), U (Understanding), A(Application), S(Skill), Essay type), SA (Short Answer type), VSA (Very Short Answer (Type), O Objective type). N(Numerical)

SUBJECT : Physics
UNIT : Centre of Mass, Rigidbodies &/ Rotational Motion Maximum Marks 25 Class: XI
Time: 30 mts.

| SL. NO. | OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Form of Questions | E/LA | SA | VSA | O | E/LA | SA | VSA | O | E/LA | SA | VSA | O | |
| | Sub Units | | | | | | | | | | | | | |
| 1. | Centre of Mass | | | | | | 2(1) | | 1(1) | | | | | 3(2) |
| 2. | Circular Motion | | | | | | | | 1(1) | 4(1) | | | 1(1) | 6(3) |
| 3. | Newton's Laws for finite bodies | | | | 1(1) | | | | | | | | | 1(1) |
| 4. | Torque and Angular Momentum | | | 1(1) | | | 4(2) | 1(1) | | | | 1(1) | | 7(5) |
| 5. | Moment of Inertia | 5(1) | | 1(1) | | | 2(1) | | | | | | | 8(3) |
| | SUB TOTAL | 5(1) | - | 2(2) | 1(1) | - | 8(4) | 1(1) | 2(2) | 4(1) | - | 1(1) | 1(1) | 25(14) |
| | TOTAL | 8(4) | | | | 11(7) | | | | 6(3) | | | | 25(14) |

Notes: Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.
* Denotes that marks have been combined to form one question.

| Summary: | | | | | |
|---|---|---|---|---|---|
| Long Answer (LA) or Essay (E) | No. | 1+1 | Marks | 5+4 |
| Short Answer (SA) | No. | 4 | Marks | 8 |
| Very short Answer (VSA) | No. | 4 | Marks | 4 |
| Objective (O) | No. | 4 | Marks | 4 |

## Question Paper

Unit : Centre of Mass, Rigid bodies and Rotational Motion

Class: XI

Time : 30 Minutes

Marks : 25

INSTRUCTIONS :

I. All questions are compulsory.

II. Questions 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A, B, C or D that corresponds to the correct answer along with its question number. Questions 5-8 are very short answer type each to be answered within a line or two.

III. Questions 9-12 are short answer type questions of 2 marks each. The answer should be within 40 words each. Question 13 is a problem of 4 marks.

IV. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

QUESTIONS :

1. The distance of centre of mass of circular solid cone of height h from the centre of its base is

   A. h/4

   B. h/3

   C. h/2

   D. 3h/4

2. The maximum speed that can be obtained without skidding by a car of mass m moving on a horizontal circular road of radius R, having kinetic friction is

   A. u Rg

   B. $\sqrt{u\ Rg}$

   C. $\sqrt{u}$ Rg

   D. $u\sqrt{Rg}$

3 Cream is extracted from milk in a machine making use of

   A. gravitational force.

   B. centrifugal force.

   C. frictional force.

   D. centripetal force.

4 Newton's laws of motion are NOT applicable to

   A. planets and large objects

   B. pollen grains in water

   C. individual atoms.

   D. bullet fired from a gun.

5. List the factors on which the torque acting on a body depends.

6. List the various factors upon which the moment of inertia depends.

7. Why don't we pull or push the door from near the hinges ?

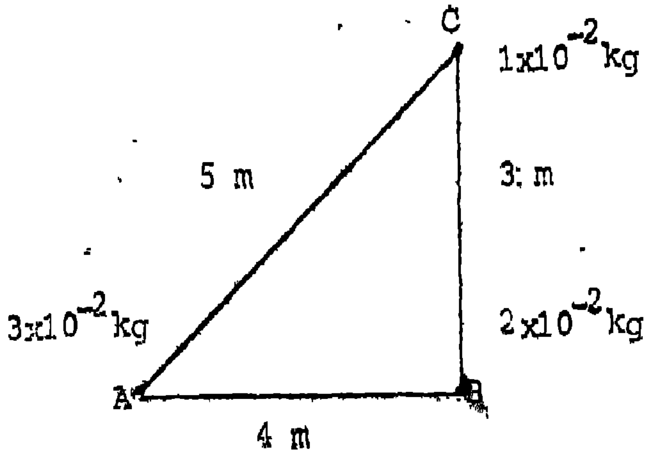
8. Explain why a fired bullet always possesses a spin ?

9. A body is standing on a rotating table with metal spheres in his hands. If he withdraws his hands towards his chest, how the angular velocity of the table will change ? Explain.

10. The dimensions of torque and work are the same. In what way they differ?

11. Illustrate diagramatically the motion of the centre of mass of Earth-Moon system. Explain it also

12. Three small bodies, which can be considered as particles, are connected by light rigid rods as shown in the figure. Calculate the moment of inertia of the system about an axis passing through point A and perpendicular to the plane of diagram.



13. A hollow cylindrical drum of radius 25 cm. is rotating around its axis in vertical direction. Calculate the minimum frequency of revolution such that if a body is kept on the inside of the cylindrical wall, it does not slip down. The coefficient of friction is u = 0.25

14. Define M.I. and radius of gyration. State and prove the theorem of parallel axis.

## MARKING SCHEME

| Q.No. | Value Point/Key | Marks | Total |
|---|---|---|---|
| 1. | A | | 1 |
| 2. | B | | 1 |
| 3. | B | | 1 |
| 4. | C | | 1 |
| 5. | Two factors, force and arm | ½+½ | 1 |
| 6. | Mass and distribution of mass | ½+½ | 1 |
| 7. i) | $\vec{\tau} = \vec{r} \times \vec{F}$ | | |
| ii) | For less force, r should be large | ½+½ | 1 |
| 8. | Spin helps the bullet to move along the desired path | 1 | 1 |
| 9. i) | Angular velocity will increase | 1 | |
| ii) | Explanation according to conservation of angular momentum. | 1 | 2 |
| 10. i) | Torque is vector quantity while work is scalar quantity | 1 | |
| ii) | Torque exists in rotational motion whereas work is done in linear as well as rotational motion | 1 | 2 |
| 11. i) | Figure of earth-moon system | 1 | |
| ii) | Explanation | 1 | 2 |
| 12. i) | Moment of inertia $I = \sum mr^2$ | ½ | |
| ii) | For the given system I = 0.57 kg $m^2$ | 1½ | 2 |
| 13. i) | Figure | 1 | |
| ii) | Derivation $\omega_{mini} = \sqrt{g/\mu r}$ | 2 | |
| iii) | Calculation $\omega_{mini}$ = 14.14/Sec | 1 | 4 |

| Q.No. | Value Point/Key | Marks | Total |
|---|---|---|---|
| 14. | i) Definition of M.I. | 1 | |
| | ii) Def. of radius of gyration | 1 | |
| | iii) Statement of theorem | 1 | |
| | iv) proof of theorem | 2 | 5 |

QUESTION-WISE ANALYSIS

| Q.No. | Objective | Specification | Sub-Unit | Form of question | Marks Allotted | Estimated Time (Mts.) | Estimated Difficult level |
|---|---|---|---|---|---|---|---|
| 1. | U | Recongises significance | Centre of Mass | O | 1 | 1 | Average |
| 2. | U | Establishes relationship | Circular Motion | O | 1 | 1 | Difficult |
| 3. | A | Illustrates | Circular Motion | O | 1 | 1 | Average |
| 4. | K | Recalls | Newtons Laws for finite bodies | O | 1 | 1 | Easy |
| 5. | K | Recalls | Torque etc. | VSA | 1 | 1 | Easy |
| 6. | K | Recalls | Moment of Inertia | VSA | 1 | 1 | Easy |
| 7. | U | Illustrates | Torque etc. | VSA | 1 | 1 | Easy |
| 8. | A | Analyses unfamiliar situation | Torque and Ang. Momentum | VSA | 1 | 1 | Difficult |
| 9. | U | Explains | Torque & Angular | SA | 2 | 2 | Difficult |
| 10. | U | Compares | Torque etc. | SA | 2 | 2 | Difficult |
| 11. | U | Illustrates | Centre of Mass | SA | 2 | 2 | Difficult |
| 12. | U | Solves | Moment of Inertia | SA | 2 | 2 | Average |
| 13. | A | Analyses unfamiliar situation (Numerical) | Circular | Numerical | 4 | 7 | Difficult |
| 14. | K | Recalls | Moment of Inertia | LA | 5 | 7 | Average |

# UNIT : 7

## GRAVITATION

# DESIGN

## OF
## UNIT TEST

| | | |
|---|---|---|
| Subject | : | Physics |
| Unit | : | Gravitation |
| Class | : | XI |
| Time | : | 30 Minutes |
| Marks | : | 25 |

I. Weightage to Objectives :

| Objective | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 28% | 56% | 16% | | 100% |
| Marks | 7 | 14 | 4 | | 25 |

II. Weightage to Form of Questions :

| Forms of Questions | E/N | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 2 | 6 | 14 |
| Marks Allotted | 5+4 | 8 | 2 | 6 | 35 |
| Estimated Time minutes | 8+6 | 9 | 2 | 6 | 30 |

III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Introduction | 1 |
| 2. | Acceleration due to gravity at the surface of earth | 1 |
| 3. | Universal law of gravitation | 5 |
| 4. | Variation in acceleration due to gravity | 3 |
| 5. | Gravitational potential energy | 6 |
| 6. | Geostationary Satellites | 5 |
| 7. | Gravitation and planets | 4 |
| | Total : | 25 |

IV. Difficulty Level :

Difficult : 24% marks.
Average : 52% marks.
Easy : 24% marks.

Abbreviations : K (Knowledge), U (Understanding), A(Application), S(Skill), E(Essay typ
SA(Short Answer type), VSA(Very Short answer type), O(Objective type), N(Nume

# BLUE - PRINT

SUBJECT : PHYSICS.
UNIT : Gravitation

MAX. 25 MARKS

CLASS : XI
TIMES : 30 Minutes.

| S.NO. OBJECTIVES SUB-UNITS | FORM OF QUESTIONS | KNOWLEDGE |  |  |  | UNDERSTANDING |  |  |  | APPLICATION |  |  |  | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | E | SA | VSA | O | E | SA | VSA | O | E | SA | VSA | O |  |
| 1. Introduction |  |  |  |  | 1(1) |  |  |  |  |  |  |  |  | 1(1) |
| 2. Acc. due to gravity. |  |  |  |  |  |  |  | 1(1) |  |  |  |  |  | 1(1) |
| 3. Universal law of Gravitation. |  |  |  |  |  | 4(1) |  |  | 1(1) |  |  |  |  | 5(2) |
| 4. Variation in acc. due to gravity. |  |  |  |  |  |  | 2(1) |  | 1(1) |  |  |  |  | 3(2) |
| 5. Gravitational Potential energy. |  | 4*(1) |  |  |  |  |  |  | 1(1) |  |  | 1*(-) |  | 6(2) |
| 6. Geostationary Satellite. |  |  |  | 1(1) |  |  | 4(2) |  |  |  |  |  |  | 5(3) |
| 7. Gravitation and planets. |  |  |  |  |  |  |  |  | 1(1) |  | 2(1) |  | 1(1) | 4(3) |
| SUB TOTALS |  | 4(1) |  | 1(1) | 1(1) | 4(1) | 6(3) | 1(1) | 4(4) |  | 2(1) | 1(-) | 1(1) | 25(14) |
| TOTALS |  |  | 6(3) |  |  |  | 15(9) |  |  |  |  | 4(2) |  | 25(14) |

NOTES: Figures within brackets indicate the number of questions and figures outside the bracket, indicate marks.

* Denotes that marks have been combined to form one question.

| SUMMERY: |  |  |  |
|---|---|---|---|
| Essay (E) | No. 1+1 | Marks | 5+4 |
| Short Answer(SA) | No. 4 | Marks | 8 |
| Very short Answer (VSA) | No. 2 | Marks | 2 |
| Objective (O) | No.6 | Marks | 6 |

## UNIT TEST

Unit : Gravitation
Class : XI
Time : 30 minutes
Marks : 25

INSTRUCTIONS :

1. All questions are compulsory.
2. Questions 1-6 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A,B,C, and D that corresponds to the correct answer along with its question number. Questions 7 & 8 are very short answer type each to be answered within a line or two.
3. Questions 9-12 are short answer type questions of 2 marks each. The answer should be within 40 words each. Question 13 in a problem of 4 marks.
4. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

QUESTIONS :

1. Which ONE of the following fundemental forces is the microscopic?

   A. Electrostatic

   B. Gravitational

   C. Electromagnetic

   D. Nuclear.

2. Gravitational force between two bodies kept in air is F. If the distance between them is halved, mass of each one of them is doubled and these are now kept in water, then the gravitational force between them will be.

   A. [illegible]F

   B. 4F

   C. 8F

   D. 16F

3. Which ONE of the following statements is False about acceleration due to gravity of the Earth?

   A. It decreases as we go high above the earth.

   B. It increases as we go inside the earth.

   C. Its value is maximum at the poles.

   D. Its value goes on increasing as we go from equator to poles.

4. The gravitional potential difference between the surface of a planet and a point 20 meter above is 8J kg-1. If the gravitational field is uniform, work done in moving a mass of 2 kg from the surface to a point 10 metres above the surface will be

   A. 0.4 J

   B. 4.0 J

   C. 8.0 J

   D. 16.0 J

5. Which ONE of the following physical quantities possessed by a comet orbiting the sun in a highly elliptical orbit remains constant?

   A. Total Energy.

   B. Potential Energy.

   C. Linear speed.

   D. Angular speed.

6. If universal gravitational constant were decreasing uniformly with time, then an orbiting satellite will have constant.

   A. radius

   B. speed

   C. time period

   D. angular momentum.

7. What is the period and plane of revolution of a geostationary satellite of the earth ?

8. Under what condition are the centre of mass and centre of gravity of a body at the same point ?

9. Two satellites are orbiting around the earth in two different circular orbits of same radius. One of the them is 50 times heavier than other. Calculate the ratio of their time periods.

10. Compute the ratio of acceleration due to gravity at two points, one inside and the other outside the earth, each at a distance $\frac{R}{2}$ from its surface, R is the radius of the earth assuming earth a sphere of uniform density.

11. Why does the speed of a plane going around the sun in an elliptical orbit decreases when it comes nearer to the sun ?

12. Why does the radius of the orbit of an artificial satellite moving around the Earth ( in its atmosphere) go on decreasing slowly with time? Explain briefly.

13. Taking moon's period of revolution about the earth of as 30 days and neglecting the effect of sun and other planets on its motion, calculate the distance between centres of moon and earth. Given $G=6.67\times10^{-11}\ Nm^2\ kg^{-2}$ and mass of the earth $=6\times10^{-24}$ kg.

14. Define escape velocity. Derive an expression for escape velocity of a body on the surface of earth. Where does a body go after escaping earth's gravitational pull? Explain it.

## SCORING KEY

| S.No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Key | D | D | B | C | A | D |
| Marks | 1 | 1 | 1 | 1 | 1 | 1 |

## Marking Scheme

| S.No. | Value Points | Marks | Total Marks |
|---|---|---|---|
| 7. | 24 hours, equitorial plane. | 1 | 1 |
| 8. | When g is constant over the whole body. | 1 | 1 |
| 9. | (i) Formula for orbital velocity | 1 | |
| | (ii) Calculation of ratio (1:1) | 1 | 2 |
| 10. | (i) Formula for g | ½ | |
| | (ii) Calculation at two points | 1 | |
| | (iii) Ratio is 8:9 | ½ | 2 |
| 11. | (i) Gravitational force increases | 1 | 2 |
| | (ii) For conservation of angular momentum speed increases. | 1 | 2 |
| 12. | (i) Due to fricition in earth's atmosphere it looses energy | 1 | 2 |
| | (ii) Due to energy loss its radius decreases i.e. as v decreases in $\frac{mv^2}{r}$ | 1 | |
| 13. | (i) $v = \frac{2\pi r}{T}$ | ½ | |
| | (ii) $\frac{mv^2}{r} = \frac{GMm}{r^2}$ | ½ | |
| | (iii) $r^3 = \frac{GMT^2}{4\pi^2}$ | 1 | 4 |

| | | | |
|---|---|---|---|
| iv. | | Substituion of values<br>and calculation of result<br>$r= 4.08\times 10^{8}m$ | 2 |
| 14. | (i) | Definition of escape velocity | 1 |
| | (ii) | Derivation of escape velocity | 3 |
| | (iii) | Explanation about body after escaping. | 1 |

## QUESTION - WISE ANALYSIS

| Q.No. | Objective | Specification | Sub-Unit | Forms of Question | Marks Allotted. | Estimated Time (min.) | Estimated difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Introduction | 0 | 1 | 1 | Easy |
| 2. | U | Solves | Universal law of gravitation. | 0 | 1 | 1 | Easy |
| 3. | U | Detects | Variation in acc. due to gravity | 0 | 1 | 1 | Easy |
| 4. | U | Solves problem | Gravitational P. Energy | 0 | 1 | 1 | Average |
| 5. | U | Explains | Gravitation and planets. | 0 | 1 | 1 | " |
| 6. | A | " | " | 0 | 1 | 1 | Difficult |
| 7. | K | Recalls | Geostationary satellites | VSA | 1 | 1 | Easy |
| 8. | U | Explains | Gravitation at surface | [illegible] | 1 | 1 | Average |
| 9. | U | Calculates | Geo-stationary satellite | SA | 2 | 2 | " |
| 10. | U | Compares | Variation in Acc. due to gravity | " | 2 | 2 | Difficult |
| 11. | A | Explains | Gravitation and planets | " | 2 | 2 | Average |
| 12. | U | Explains | Geo-stationary satellite | SA | 2 | 2 | Difficult |
| 13. | U | Solves Numerical | Universal law of gravitation | Numerical | 4 | 6 | Average |
| 14. | A | Derives relation and explains. | Gravitation P. Energy. | Essay | 5 | 8 | Average |

# UNIT : 8

## MOLECULES

# DESIGN
# OF
# UNIT TEST

Subject : Physics
Unit : Molecules
Class : XI
Time : 30 minutes
Marks : 25

I. Weightage to Objectives :

| Objectives | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 40 | 44 | 16 | - | 100 |
| Marks | 10 | 11 | 4 | - | 25 |

II Weightage to Form of Questions :

| Forms of Questions | E/N | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 4 | 4 | 14 |
| Marks Allotted | 5+4 | 8 | 4 | 4 | 25 |
| Estimated Time | 14 | 8 | 4 | 4 | 30 |

III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Atomic Hypothesis and development | 1 |
| 2. | Brownian motion | 6 |
| 3. | Avogadro's Hypothesis | 11 |
| 4. | Inter molecular and inter atomic forces | 3 |
| 5. | States of matter | 4 |
| | Total = | 25 |

IV. Difficulty level : Difficult : 24 % marks.
Average : 40 % marks.
Easy : 36 % marks.

Abbreviations : K (Knowledge), U (Understanding), A (Application), S (Skill), E (Essay type), SA (Short Answer type), VSA (Very Short Answer (Type), O (Objective type), N (Numerical).

# BLUE PRINT

Subject : Physics
Unit : Molecules

Maximum Marks 25

Class: XI
Time : 30 mts.

| Sl.No. | OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Form of Questions | E/LA | SA | VSA | O | E/LA | SA | VSA | O | E/LA | SA | VSA | O | |
| | Sub Units | | | | | | | | | | | | | |
| 1. | Atomic Hypothesis and Development | | | | | | | 1(1) | | | | | | 1(1) |
| 2. | Brownian Movement | 5(1) | | | | | | | | | | 1(1) | | 6(2) |
| 3. | Avogadro Hypothesis | | | 1(1) | 1(1) | 4(1) | 2(1) | | 1(1) | | 2(1) | | | 11(6) |
| 4. | Intra-atomic and molecular forces | | | 1(1) | | | 2(1) | | | | | | | 3(2) |
| 5. | States of Matter | | 2(1) | | | | | 1(1) | | | | | 1(1) | 4(3) |
| | SUB TOTAL | 5(1) | 2(1) | 2(2) | 1(1) | [illegible](1) | 4(2) | 2(2) | 1(1) | | 2(1) | 1(1) | 1(1) | 25(14) |
| | TOTAL | 10(5) | | | | 11(6) | | | | 4(3) | | | | 25(14) |

Notes : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.

Summary : Long Answer (LA) or Essay (E) No. 1+1 Marks 5+4
Short Answer (SA) No. 4 Marks 8
Very Short Answer (VSA) No. 4 Marks 4
Objective (O) No. 4 Marks 4

## UNIT TEST

Unit : Molecules
Class : XI

Time : 30 minutes
Marks : 25

INSTRUCTIONS :

1. All questions are compulsory.
2. Questions 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A, B, C or D that corresponds to the correct answer along with its question number. Questions 5-8 are very short answer type each of 1 mark to be answered within a line or two.
3. Questions 9-12 are short answer type questions of 2 marks to be answered in not more than 150 words.

QUESTIONS :

① Of the following gases, each of mass 1g, which contains more molecules at S.T.P.?

A. Oxygen

B. Hydrogen

C. Nitrogen

D. Helium

② The inter molecular forces among molecules is the weakest in

A. amorphous solids

B. liquids

C. gases

D. crystalline solids

: ? :

③ $N_2 + 3H_2 - 2 NH_3$

This equation justifies

A. Avogadre's Hypothesis

B. Law of multiple proportions

C. Dalton's atomic theory

D. Berzelius Hypothesis

④ The temperature at which three states of matter co-exists is called

A. critical point

B. curie point

C. inversion point

D. triple point

5. State Avogadro's Hypothesis

6. If the absolute temperature and pressure are independently doubled, what happens to the intra-molecular distances in a gas .

7. $N_2O$, NO, $N_2O_3$, $NO_2$, $N_2O_5$ are five compounds of Nitrogen and oxygen. What is the ratio of the weights of Oxygen which combine with the same amount of Nitrogen.

⑧ The Zig-Zag motion of pollen grains suspended on water surface justifies the concept of intra molecular collisions. Is the movement of a boat near a shore of the sea due to the same phenomenon ? Explain.

9. What is the usual shape of a molecule ? Can they have other type of shapes? Explain.

10. If 2g of $H_2$ at N.T.P. contain $6x10^{23}$ molecules, how many molecules are contained in 0.2g of $O_2$ at N.T.P. ?

11. Draw a graph showing the magnitude of the force between two identical atoms as a function of separation R between their nuclei. In the graph locate the point where the atoms will have minimum energy.

12. The atomic mass of aluminium is 27 and its relative density is 2.7 what is the volume of one atom of the element ?

13. Find the number of Nitrogen molecules present in a flask of capacity one litre at a temperature of - 136.5° C and a pressure of 1 mm of Hg

14. Explain Brownian Motion. Describe an experiment to show the motion to which concept does this experiment lead with regard to molecules ?

## MARKING SCHEME

| S.No. | Value Points/Key | Marks | Total |
|---|---|---|---|
| 1. | B | 1 | 1 |
| 2. | C | 1 | 1 |
| 3. | A | 1 | 1 |
| 4. | D | 1 | 1 |
| 5. | Statement of the hypothesis | 1 | 1 |
| 6. | Remains unchanged | 1 | 1 |
| 7. | The ratio is 1:2:3:4:5 | 1 | 1 |
| 8. | No. it is macrosopic phenomenon, while pollen motion is microscopic | ½ + ½ | 1 |
| 9. | Sphrical, other type of molecule shapes as rod like produces liquid phase crystal different than isotsopic liquids and crystalline solids | 1+1 | 2 |
| 10. | 32 gms of $O_2$ contain molecules = $6\times10^{23}$ | 1 | 2 |
| | 2 gms of $O_2$ contain =$.375\times10^{22}$ molecules | 1 | 2 |
| 11. | (i) Drawing of graph. | 1 | 2 |
| | (ii) Point P where F is zero and energy is minimum. | 1 | |
| 12. | (i) Volume of 1 gm atom of almunium= 10 c.c. | 1 | 2 |
| | (ii) " " 1 atom = $\frac{10}{N}$ = $1.66\times10^{-23}$ c.c | 1 | |
| 13. | (i) Equation PV = nk T | 1 | |
| | (ii) Putting correct values | 1 | 4 |
| | (iii) Simplifying | | |
| | (iv) Result $n=.71\times10^{17}$ molecules | 1 | |
| 14. | (i) Explanation | 2 | |
| | (ii) Experiment | 2 | 5 |
| | (iii) Concept (molecular motion) | 1 | |

## QUESTION-WISE ANALYSIS

| Q.No. | Objective | Specification | Sub-Unit | Form of Question | Marks Alloted | Estimated Time (Mts.) | Estimat Difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recognises | Avogadro's Hypothesis | O | 1 | 1 | Easy |
| 2. | K | " | Inter-atomic forces | " | " | " | Easy |
| 3. | U | Identifies | Avogadro's Hypothesis | " | " | " | Average |
| 4. | A | Analyses | States of matter | " | " | " | Difficu |
| 5. | K | Recalls | Avogadro's Hypothesis | VSA | " | " | Easy |
| 6. | U | Explains | States of Matter | " | " | " | Average |
| 7. | U | Calculates | Atomic Hypothesis | " | " | " | Easy |
| 8. | A | Explains | Brownian Motion | " | " | " | Diffic |
| 9. | K | Recalls | States of Matter | SA | 2 | 2 | Averag |
| 10. | U | Calculates | Avogadro's Hypothesis | " | " | " | Diffic |
| 11. | U | Explains | Inter-atomic forces | " | " | " | Avera |
| 12. | A | Calculates | Avogadro's Hypothesis | " | " | " | Diffic |
| 13. | U | Solves | " | Numerical | 4 | 7 | Avera |
| 14. | K | Recalls | Brownian | LA | 5 | 7 | Easy |

## UNIT : 9

# PROPERTIES OF MATTER

## QUESTION-WISE ANALYSIS

| Q.No. | Objective | Specification | Sub-Unit | Form of Question | Marks Alloted | Estimated Time (Mts.) | Estima Difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recognises | Avogadro's Hypothesis | 0 | 1 | 1 | Easy |
| 2. | K | " | Inter-atomic forces | " | " | " | Easy |
| 3. | U | Identifies | Avogadro's Hypothesis | " | " | " | Average |
| 4. | A | Analyses | States of matter | " | " | " | Difficu |
| 5. | K | Recalls | Avogadro's Hypothesis | VSA | " | " | Easy |
| 6. | U | Explains | States of Matter | " | " | " | Average |
| 7. | U | Calculates | Atomic Hypothesis | " | " | " | Easy |
| 8. | A | Explains | Brownian Motion | " | " | " | Diffic |
| 9. | K | Recalls | States of Matter | SA | 2 | 2 | Averag |
| 10. | U | Calculates | Avogadro's Hypothesis | " | " | " | Diffi |
| 11. | U | Explains | Inter-atomic forces | " | " | " | Avera |
| 12. | A | Calculates | Avogadro's Hypothesis | " | " | " | Diffi |
| 13. | U | Solves | " | Numerical | 4 | 7 | Avera |
| 14. | K | Recalls | Brownian | LA | 5 | 7 | Easy |

## UNIT : 9

# PROPERTIES OF MATTER

## DESIGN
## UNIT TEST

SUBJECT : Physics
UNIT : Properties of Matter
CLASS : XI
TIME : 30 Minutes
MARKS : 25

I. Weightage to Objectives:

| Objective | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 24 | 48 | 28 | - | 100% |
| Marks | 6 | 12 | 7 | - | 25 |

II. Weightage to Form of Questions:

| Forms of Question | E | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 3 | 5 | 14 |
| Marks Allotted | 5+4 | 8 | 3 | 5 | 25 |
| Estimated Time (in minutes) | 8+6 | 8 | 3 | 5 | 30 |

III. Weightage to Content:

|  | Sub-Units | Marks |
|---|---|---|
| 1. | Solids | 6 |
| 2. | Fluids | 9 |
| 3. | Liquids | 4 |
| 4. | Gases | 6 |
|  | Total | 25 |

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IV. Difficulty level: Difficult : 20% marks
Average : 10% marks
Easy : 20% marks

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Abbreviations: K(Knowledge), A(Application), S(Skill) E(Essay type), SA(Short Answer type), VSA(Very Short Answer), O(Objective type).

## BLUE PRINT

Subject: Physics Class: XI

Unit: Properties of Matter Maximum Marks: 25 Time: 30 Minutes.

| S.No. | OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sub-Units Form of Qus. | E | SA | VSA | O | E | SA | VSA | O | E | SA | VSA | O | |
| 1. | Solids | 2(1) | | | | | 2(1) | | | | | 1(1) | 1(1) | 6(4) |
| 2. | Fluids | 2(1) | | | | 5(1) | | | | | | | 2(2) | 9(4) |
| 3. | Liquids | | | 1(1) | | | | | 1(1) | | 2(1) | | | 4(3) |
| 4. | Gases | | | | 1(1) | 4(1) | | | | | | 1(1) | | 6(3) |
| | Sub Total | 4(2) | | 1(2) | 1(1) | 9(2) | 2(1) | - | 1(1) | | 2(1) | 2(2) | 3(3) | 25(14) |
| | | 6(4) | | | | 13(4) | | | | 7(6) | | | | 25(14) |

Notes: Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.

| | | | |
|---|---|---|---|
| Summary: | Essay (E) Numerical (N) | No. 1+1 | Marks 5+4 |
| | Short Answer (SA) | No. 4 | Marks 8 |
| | Very Short Answer (VSA) | No. 3 | Marks 3 |
| | Objective (O) | No. 5 | Marks 5 |

## UNIT TEST

Unit: Properties of Matter Max. Marks: 25

Class: XI Time: 30 Minutes.

### INSTRUCTIONS

1. All questions are compulsory.

2. Questions 1-5 are multiple choice type of 1 mark each. For each question four alternatives are given, out of which ONLY ONE is correct. Write in the answer sheet A, B, C or D that corresponds to the correct answer along with its question number. Questions 6-8 are very short answer type each to be answered within a line or two.

3. Questions 9-12 are short answer type questions of 2 marks each. The answer should be within 40 words each. Question 13 is a problem of 4 marks.

4. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

### QUESTIONS:

1. A flask contains helium and argon in the ratio of [illegible]:1 by mass. If the temperature of the mixture is 27°C and the atomic masses of helium and argon are 4 and 16 respectively, then the ratio of their average kinetic energies per molecule will be ...

   A. 10 : 1

   B. 2.5 : 1

   C. 2 : 1

   D. 1 : 1

2. Which one of the following statement is NOT true?

   A. Surface tension of a liquid is independent of the surface area.

   B. Liquid detergents have large angles of contact

   C. A drop of liquid under no external force is always spherical in shape.

   D. The angle of contact of mercury with glass is obtuse while that of ~~a~~ water with glass is acute.

3. The cross-section of commonly used load bearing girders in the constructions of roofs is made 'I' shaped because it

   A. helps in the hanging of fans etc.

   BB. prevents two much bending.

   C. prevents two much buckling.

   D. prevents bending as well as bucking.

4. A beaker containing water weighs 1N. It is placed on the pan of a single arm balance and a piece of metal weighing 0.7 N and volume $10^{-4}$ $m^3$ is placed inside the water in the beaker. The beaker will now weigh.

   A. 1.7 N

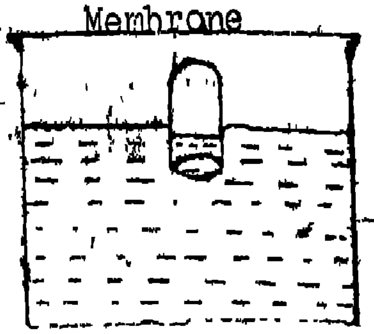
   B. 1.6 N

   C. 1.0 N

   D. 0.3 N

5. A test tube partially filled with water is inverted in a large jar of water in such a way that it floats vertically as shown. The lower end of the test

tube is open and the top of the jar is covered by a tightly fitted thin rubber membrane. As the membrane is pushed downwards the test tube



A. starts going up.

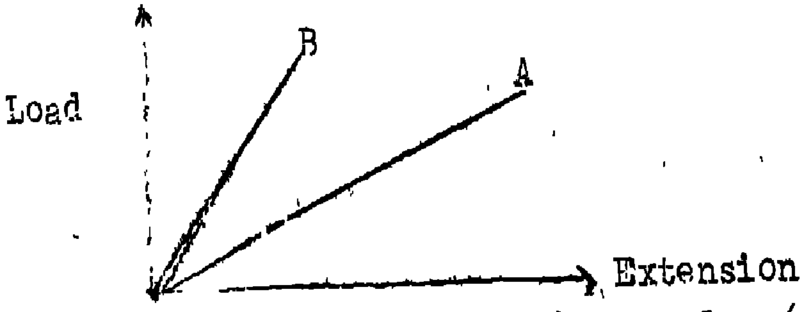
B. starts going down.

C. remains undisturbed.

D. gets filled up with water completely.

6. What is the energy cost of a molecule at the surface of a liquid?

7. The graph given below shows load-extension curve for two wires A and B of the same material and of same length. Which one of them is thicker?



8. A mixture of oxygen (At. mass 16) and helum (At. mass 4) is filled in a flask at 37$^{0}$ C. What is the ratio of the root mean squared speeds of the molecules of the two gases?

9. Define the following terms giving one example of each.

(a) Crystalline soilds

(b) Glassy soilds.

10. State Bernoulli's theorem and name its two applications

11. A ball is subjected to a uniform pressure P. If the bulk modulus and coefficient of cubical expansion of the material of the ball are K and $\gamma$ respectively find the rise in temperature required to bring the ball to its original volume.

12. Two straws are floating parallel and near each other on a water surface. Water surface between them is touched by a hot needle. Explain what happens and why?

13. $32 \times 10^{-2}$ cm$^3$ of air at the atmospheric pressure is forced into the space above mercury in a barometer. If the atmospheric pressure is 75 cm (Hg) and the space above mercury level in the tube (area of cross section 1 cm$^2$) is 10 cm, find the reading of the barometer after forcing the air inside.

14. Which law governs the functioning of a hydraulic jack? State the law. Explain with the help of a labelled diagram how this law is utilized in a hydraulic press?

## SCORING KEY

| S. No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Key | D | B | D | A | B |
| Marks | 1 | 1 | 1 | 1 | 1 |

## MARKING SCHEME

| S.No. |  | Value Points | Marks | Total |
|---|---|---|---|---|
| 6. |  | Roughly half the heat of evaporation | 1 | 1 |
| 7. |  | Wire B is thicker | 1 | 1 |
| 8. |  | The ratio is $2\sqrt{2} : 1$ | 1 | 1 |
| 9. | i) | Two definitions | ½+½ |  |
|  | ii) | Two examples | ½+½ | 2 |
| 10. | i) | Statement | 1 |  |
|  | ii) | Two applications | ½+½ | 2 |
| 11. | i) | Change in volume $dv = PV/K$ | 1 |  |
|  | ii) | Change in volume due to expansion $dv = \gamma vt$ | 1 |  |
|  | iii) | Rise in temperature = $\frac{PV}{KV\gamma}$ | 1 | 2 |
| 12. | i) | Straws move apart | 1 |  |
|  | ii) | Because hot water has low surface tension | 1 | 2 |
| 13. | i) | Writing values of $P_1$ $V_1$ and $P_2$ $V_2$ | 1 | 1 |
|  | ii) | Equating the two | 1 |  |
|  | iii) | Solving for pressure (Ans. 75 cm of Hg) | 2 | 4 |
| 14. | i) | Name of the law | 1 |  |
|  | ii) | Statement of the law | 1 | 5 |
|  | iii) | Labelled diagram | 1 |  |
|  | iv) | Explanation | 2 |  |

## QUESTION WISE ANALYSIS

| S.No. | Objective | Specification | Sub-Unit | Forms of Question | Marks Allotted | Estimated Time | Difficult level. |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Gases | 0 | 1 | 1 | Average. |
| 2. | U | Discriminates | Liquids | 0 | 1 | 1 | Easy |
| 3. | A | Analyses | Solids | 0 | 1 | 1 | Average. |
| 4. | A | Analyses | Fluids | 0 | 1 | 1 | Difficult |
| 5. | A | Analyses | Fluids | 0 | 1 | 1 | Average. |
| 6. | U | Sees relationship. | Liquids | VSA | 1 | 1 | " |
| 7. | A | Analyses | Solids | VSA | 1 | 1 | " |
| 8. | A | Calculates | Gases | VSA | 1 | 1 | " |
| 9. | K | Recalls | Solids | SA | 2 | 2 | Easy. |
| 10. | K | Recalls | Fluids | SA | 2 | 2 | " |
| 11. | U | Derives | Solids | SA | 2 | 2 | Difficult. |
| 12. | A | Analyses | Liquids | SA | 2 | 2 | " |
| 13. | U | Calculates | Gases | Numerical | 4 | 6 | Average. |
| 14. | U | Draws & Explains | Fluids | LA | 5 | 8 | " |

# UNIT : 10

# HEAT AND THERMODYNAMICS

# DESIGN
# OF
# UNIT TEST

Subject : Physics
Unit : Heat and Themodynamics
Class : IX
Time : 30 minutes
Marks : 25

I. Weightage to Objectives :

| Objectives | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 24 | 56 | 20 | - | 100 |
| Marks | 6 | 14 | 5 | - | 25 |

II. Weightage to Form of Questions :

| Forms of Questions | E/N | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 4 | 4 | 14 |
| Marks Allotted | 5+4 | 8 | 4 | 4 | 25 |
| Estimated Time (minutes) | 8+6 | 8 | 4 | 4 | 30 |

III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Heat and Temperature | 2 |
| 2. | Thermal Expansion | 2 |
| 3. | Specific heat | 2 |
| 4. | First law of Thermodynamics | 2 |
| 5. | Thermodynamic state | 3 |
| 6. | Phase and phase diagrams | 2 |
| 7. | Second law of thermodynamics and Heat Engines, Refrigerator | 8 |
| 8. | Transfer of heat | 4 |
| | Total | 25 |

IV. Difficulty level : Difficult : 24 % marks
Average : 56 % marks
Easy : 20 % marks

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Abbreviations : K (Knowledge), U (Understanding), A (Application), S (Skill), E (Essay type), SA (Short Answer type), VSA (Very Short Answer Type) , O(Objective type). N(Numerical).

## BLUEPRINT

Subject : Physics
Unit : Heat and Themodynamics
Maximum Marks 25
Class : XI
Time : 30 Mts.

| Sl.No. | OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Forms of Questions | E/LA | SA | VSA | O | E/LA | SA | VSA | O | E/LA | SA | VSA | O | |
| | Sub Units | | | | | | | | | | | | | |
| 1. | Heat & Temperature | | | | 1(1) | | | | 1(1) | | | | | 2(2) |
| 2. | Thermal Expansion | | | | | | | | 1(1) | | | 1(1) | | 2(2) |
| 3. | Specific heat | | | 1(1) | | | | 1(1) | | | | | | 2(2) |
| 4. | First law of Thermodynamics | | | | | | | | | | 2(1) | | | 2(2) |
| 5. | Thermodynamic State | | 2(1) | | | | | | | | | | 1(1) | 3(2) |
| 6. | Phase and phase diagrams | | | | | | 2(1) | | | | | | | 2(1) |
| 7. | Second law of thermodynamics etc. | 5(1) | | | | | 2(1) | | | | | 1(1) | | 8(3) |
| 8. | Transfer of heat | | | | | 4(1) | | | | | | | | 4(1) |
| | SUB TOTAL | 5(1) | 2(1) | 1(1) | 1(1) | 4(1) | 4(2) | 1(1) | 2(2) | | 2(1) | 2(2) | 1(1) | 25(14) |
| | TOTAL | | | 9(4) | | | 11(6) | | | | | 5(4) | | 25(14) |

Notes : Figures within brackets indicate the number of questions and figures outside the brackets indicate marks.

| Summary : | | | |
|---|---|---|---|
| Long Answer (LA) or Essay (E) | No. 1+1 | Marks | 5+4 |
| Short Answer (SA) | No. 4 | Marks | 8 |
| Very Short Answer (VSA) | No. 4 | Marks | 4 |
| Objective (O) | No. 4 | Marks | 4 |

## UNIT TEST

Unit : Heat and Thermodynamics — Marks : 25
Class : XI — Time : 30 mts.

INSTRUCTIONS :

1. All questions are compulsory.
2. Questions 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A, B, C or D that corresponds to the correct answer along with its question number. Questions 5-8 are very short answer type each to be answered within a line or two. Questions 9-12 are short answer type questions of 2 marks each. The answer should be within 40 words each. Question 13 is a problem of 4 marks.
4. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

QUESTIONS :

1. The melting point of tungston is measured by a
   - A. mercury thermameter.
   - B. gas thermameter.
   - C. resistance thermameter.
   - D. alcohal thermameter.
3. Water is heated from $0^{\circ}C$ to $10^{\circ}C$ . Its density will
   - A. decrease continously.
   - B. remain constant.
   - C. increase continously.
   - D. increase first and then decrease.

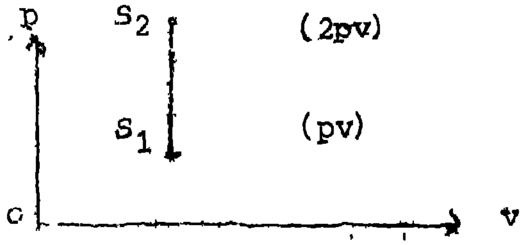
4. A thermodynamical system goes from state $S_1$ to state $S_2$ (as shown in the fig.), the external work done is -

A. zero

B. pv

C. 2 pv

D. $2 p^2 v^2$



5. What is the unit of molar specific heat of a gas at constant pressure ?

6. Why a coolant in a chemical/ nuclear plant should have high specific heat ?

7. Explain why is 'Invar' used for making the pendulum of a clock ?

8. Can we cool a room while keeping the door of a refrigerator open ? Explain.

9. What are reversible and irrevessible processes ? Give one example of each.

10. A Carnot's engine takes 2095 J of heat per cycle from source at 400 K and rejects 1676 J to the sink. Calculate the temperature of the sink and efficiency of the engine.

11. How much is the temperature of triple point of water on an absolute scale whose unit interval size is equal to that of Fahrenheit scale ?

12. Water cannot be boiled by passing steam through it. Explain.

13. The mean temperature of the filament of a 40 watt electric bulb is 2773 K. Its length is 10 cm and diameter is 0.1 mm. Assuming that all the heat is lost by radiation, calculate the emissive power of the filament. (Given $\sigma$ = 5.67 x $10^{-8}$ SIU)

14. Describe the construction and working of internal combustion engine. How it differes from external combustion engine ? (Give two differences)

## MARKING SCHEME

| S.No. | Value points/Key | Marks | Total marks |
|---|---|---|---|
| 1. | C | 1 | 1 |
| 2. | D | 1 | 1 |
| 3. | D | 1 | 1 |
| 4. | A | 1 | 1 |
| 5. | Cal/mole/°C Cal $\text{mole}^{-1}\text{K}^{-1}$ | 1 | 1 |
| 6. | So that it may absorb more heat. | 1 | 1 |
| 7. | Because its co-efficient of expansion is very small. | 1 | 1 |
| 8. | No, because inside and outside temp.-erature is same. | 1 | 1 |
| 9. | (i) Two definitions | ½ + ½ | 2 |
|  | (ii) Two Examples | ½ + ½ |  |
| 10. | (i) Equation $Q_1/Q_2 = T_1 / T_2$ | ½ |  |
|  | (ii) Calculation of sink Temp. (320 K) Ans. | ½ | 2 |
|  | (iii) Calculation of Efficiency (.2) Ans. | 1 |  |
| 11. | (i) Relation between C, and F, scales | 1 | 2 |
|  | (ii) Calculation of triple point in temperature Fahrenheit scale (491.69) Ans. | 1 |  |
| 12. | When water is heat to 100° C, its temperature is equal to steam. Hence no further heat exchange can take place | 2 | 2 |
| 13. | (i) Surface area | 1 |  |
|  | (ii) Energy emitted per sec = $\sigma AT^4$, | 1 | 4 |
|  | (iii) Correct calculation of emissive power (.38) Ans. | 2 |  |
| 14. | (i) Construction | 1 |  |
|  | (ii) Working | 2 | 5 |
|  | (iii) Two differences | 2 |  |

## QUESTION-WISE ANALYSIS

| Q. No. | Objective | Specification | Sub-Unit | Form of Question | Marks Allotted | Estimated Time (Mts.) | Estimated Difficulty |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Temperature | 0 | 1 | 1 | Easy |
| 2. | U | Selects | " | 0 | 1 | 1 | " |
| 3. | U | " | Thermal Expansion | 0 | 1 | 1 | " |
| 4. | A | Analyses | Thermodynamic State | 0 | 1 | 1 | Average |
| 5. | K | Recalls | Specific heat | VSA | 1 | 1 | Easy |
| 6. | U | Explains | " | " | 1 | 1 | Average |
| 7. | A | Analyses | Thermal Expansion | " | 1 | 1 | Average |
| 8. | A | " | Second law of Thermodynamics etc. | | 1 | 1 | Difficult |
| 9. | K | Recalls | Thermodynamic State | SA | 2 | 2 | Easy |
| 10. | U | Calculates | Second law of Thermodynamics etc. | " | " | " | Average |
| 11. | A | Solves | Phase and phase diagram | " | " | " | Difficult |
| 12. | A | Analyses | First law of Thermodynamics | " | " | " | Difficult |
| 13. | U | Solves | Second law of Thermodynamics etc. | Numerical | 4 | 6 | Average |
| 14. | K | Recalls | Heat Engines | LA | 5 | 8 | Average |

# UNIT : 11

# OSCILLATIONS

# DESIGN
# OF
# TEST

Subject : Physics
Unit : Oscillations
Class : XI
Time : 25

## I. Weightage to Objectives :

| Objectives | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 36 | 44 | 20 | - | 100 |
| Marks | 9 | 11 | 5 | - | 25 |

## II. Weightage to Form of Questions :

| Forms of Questions | E/N | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 2 | 4 | 3 | 5 | 14 |
| Marks Allotted | 9 | 8 | 3 | 5 | 25 |
| Estimated Time(minutes) | 14 | 8 | 3 | 5 | 30 |

## III. Weightage to Content :

| | Sub-Units | Marks |
|---|---|---|
| 1. | Periodic Functions | 4 |
| 2. | S.H. Motion | 6 |
| 3. | Oscillations due to spring | 2 |
| 4. | Simple pendulum etc | 9 |
| 5. | Forced osallations, resonance | 3 |
| 6. | Damped oscillation | 1 |
| | Total | 25 |

## IV. Difficulty level :

Difficult : 20% marks.
Average : 55% marks.
Easy : 25% marks.

Abbreviasations : K (Knowledge), U(Understanding), A (Application), S (Skill), E(Essay-type), SA(Short Answer type), VSA(Very Short Answer type), O(Objective type), N(Numerical).

## BLUE-PRINT

Subject : Physics  Class : XI

Unit : Oscillations  Max. Marks : 25  Time : 30 minutes.

| Sl.No. | Objectives | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sub-Units/<br>Form of Questions | E/LA | SA | VSA | 0 | E/LA | SA | VSA | 0 | E/LA | SA | VSA | C | E/ | SA | |
| 1. | Periodic functions | | | | 1(1) | | 2(1) | | | | | 1(1) | | | | 4(3 |
| 2. | Simple harmonic Motion | | | | | | 2(1) | 1(1) | | | 2(1) | | 1(1) | | | 6(4 |
| 3. | Oscillations due to spring. | | | 1(1) | | | | | | | | | 1(1) | | | 2(2 |
| 4. | Simple pendulum etc. | 5(1) | | | | 4(1) | | | | | | | | | | 9(2 |
| 5. | Resonance& Forced vibrations. | | 2(1) | | | | | | 1(1) | | | | | | | 3(2 |
| 6. | Damped oscillations | | | | | | | | 1(1) | | | | | | | 1( |
| | Sub Total | 5(1) | 2(1) | 1(1) | 1(1) | 4(1) | 4(2) | 1(1) | 2(2) | | 2(1) | 1(1) | 2(2) | | | 25(1 |
| | Total | 9(4) | | | | 11(6) | | | | 5(4) | | | | | | 25(1 |

Notes : Figures within brackets indicate the number of questions and figures outside the brack
indicate marks.

| | | | |
|---|---|---|---|
| Summary : | Long Answer (LA) or Essay (E) | No. 1+1 | Marks 9 |
| | Short Answerr (SA) | No. 4 | Marks 8 |
| | Very Short Answer (VSA) | No. 3 | Marks 3 |
| | Objective (0) | No. 5 | Marks 5 |

## UNIT TEST PAPER

Unit : Oscillations  Max. Marks: 25
Class : XI  Time : 30 mts.

**Instructions :**

I. All questions are compulsory

II. Questions 1 to 5 are multiple choice type having 1 mark each. For each question four alternative answers are provided out of which ONLY ONE is correct. Write in the answer sheet A,B,C or D that corresponds to the correct answer along with its question number.

III. Questions 6 and 8 are very short answer type of 1 mark each and must be answered in a sentence or two.

IV. Questions 9 to 12 are short answer type of 2 marks each. The answer should not exceed 40 words each.

V. Questions 13 and 14 are long-anser type of 4 and 5 marks to be answered within 100 words each.

**Questions :**

1. The displacement of a particle in S.H.M. is given by $x = a \cos (wt + \phi)$. If time in the equation is increased by $(2\pi/w)$, the value of displacement becomes

   A. 0

   B. $\frac{X}{2}$

   C. X

   D. 2 X

2. The lengths of an open pipe and a closed pipe are equal. Their fundamental frequencies are in the a ratio of

   A. 1 : 2

   B. 2 : 1

   C. 1 : 4

   D. 1 : 1

3. A pendulum executing damped oscillations indicates that

   A. Oscillations are periodic

   B. amplitude is of decreasing order.
   C. energy of the pendulum is continiously dissipated.

   D. all the above are ture.

4. A mass m is hanging from a spring of spring constant K. Now the spring is cut into two equal halves and then the same mass is suspended with one of the spring. The spring constant of the new spring is.

   A. K/2

   B. K

   C. 2K

   D. $K^2$

5. The total energy of a simple pendulum is E. When the displacement is half of the amplitude, its K.E will be

   A. 3E/4

   B. E

   C. E/2

   D. E/4

6. State the principle of spring balance ?

7. Corelate the phase difference and path difference of a particle executing S.H.M.

8. All S.H.Ms are periodic but all periodic motions are not S.H.M. Explain it with an example.

9. What is resonance ? Give at least two examples.

10. Is uniform circular motion also simple harmonic motion ? Explain.

11. The distance travelled by a particle under S.H.M. from its mean position in 2 seconds is equal to $\sqrt{3}/2$ of its amplitude and its time period.

12. Represent the following two expressions graphically and differentiate the two in terms of their phase.

    (i) $y = a \cos 2\pi t/T$ (ii) $y = a \sin 2\pi t/T$

13. A second pendulum oscillates with an amplitude of 10 cm. If the suspending thread were cut when the bob was in its mean position, what will be its velocity and acceleration at that instant ? What will be the nature of subsequent motion ? Explain.

14. Describe S.H.M. Show that the oscillations of simple pendulum are S.H.M. Derive an expression for its time period.

## Marking Scheme

| S. No. | Value Point/Key | | Total Marks |
|---|---|---|---|
| 1. | C | | 1 |
| 2. | B | | 1 |
| 3. | D | | 1 |
| 4. | C | | 1 |
| 5. | A | | 1 |
| 6. | Elongation is proportional to the weight | 1 | 1 |
| 7. | $\Delta\phi = \frac{2\pi}{\lambda}\Delta x$ | 1 | 1 |
| 8. | Explanation with example | 1 | 1 |
| 9. | (i) Definition | 1 | |
| | (ii) Two Examples | 1 | 2 |
| 10. | (i) No | 1 | |
| | (ii) Explanation -acceleration not proportional to displacement | 1 | 2 |
| 11. | (i) Calculation of $w = \pi/6$ | 1 | |
| | (ii) Calculation of T= 12s | 1 | 2 |
| 12. | (i) Graphical representation. | 1 | |
| | (ii) Difference in terms of phase at mean position | 1 | 2 |
| 13. | (i) Maximum velocity = $40\pi$ cms $^{-1}$ | 1 | |
| | (ii) Acceleration = 9.8ms$^{-2}$ | 1 | |
| | (iii) Parabolic motion | 1 | |
| | (iv) Explanation. | 1 | 4 |
| 14. | (i) Description of S.H.M. | 2 | |
| | (ii) Pendulum oscillation are S.H.M. | 2 | |
| | (iii) Expression for time period. | 1 | 5 |

## QUESTION & WISE ANALYSIS

Specifi

| Q.No. | Objective | Specification | Sub-unit | Forms of Questions | Marks Allotted | Estimated Time (Minutes) | Estimated Difficulty level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Periodic functions | O | 1 | 1 | Easy |
| 2. | U | Selects | Resonance | O | 1 | " | Easy |
| 3. | U | " | Damped oscillations | O | 1 | " | Average |
| 4. | A | Analyses | Oscillation due to spring | O | 1 | " | Difficult |
| 5. | A | " | S.H.Motion | O | 1 | " | Easy |
| 6. | K | Recalls. | Oscillations due to a spring | VSA | 1 | " | Average |
| 7. | U | Relates | S.H.M. | VSA | 1 | " | Easy |
| 8. | A | Explains | Perodic Functions | VSA | 1 | " | Easy |
| 9. | K | Recalls | Resonance | SA | 2 | " | Average |
| 10. | U | Explains | Periodic Functions. | SA | 2 | 2 | Difficult |
| 11. | U | Calculates | S.H.Motion | SA | 2 | " | " |
| 12. | A | Analyses | S.H.Motion | SA | 2 | " | " |
| 13. | U | Solves | Simple Pendulum. | N | 4 | 6 | Average |
| 14. | K | Recalls | Simple Pendulum. | LA | 5 | 8 | Average |

# UNIT 12

## WAVES

# DESIGN OF UNIT TEST

Subject : Physics
Unit : Waves
Class : XI
Time : 30 mts.
Marks : 25

## I. Weightage to Objectives:

| Objective | K | U | A | S | Total |
|---|---|---|---|---|---|
| Percentage of marks | 40 | 44 | 16 | - | 100% |
| Marks | 10 | 11 | 4 | - | 25 |

## II. Weightage to Forms of Questions:

| Forms of Questions | E/N | SA | VSA | O | Total |
|---|---|---|---|---|---|
| No. of Questions | 1+1 | 4 | 4 | 4 | 14 |
| Marks Allotted | 5+4=9 | 8 | 4 | 4 | 25 |
| Estimated Time | 12 | 10 | 4 | 4 | 30 |

## III. Weightage to Content:

| Sub-Units | Marks |
|---|---|
| 1. Wave propagation and differant kinds of waves. | 8 |
| 2. Acustices of Buildings | 3 |
| 3. Superposition principle | 3 |
| 4. Musical sounds | 2 |
| 5. Stationary waves and normal modes | 4 |
| 6. Beats and Doppler Effect | 5 |
| Total | 25 |

## IV. Difficulty level : Difficult : 16% marks

Average : 60% marks
Easy : 24% marks

Abbreviations: K(Knowledge), U(Understanding), A(Application), S(Skill) E(Easy type), SA(Short-Answer type), O(Objective type) N(Numerical).

## BLUE PRINT

Subject: Physics Class : XI

Unit: Waves Time : 30 mts.

| OBJECTIVES | KNOWLEDGE | | | | UNDERSTANDING | | | | APPLICATION | | | | SKILL | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub-Units Form of questions | E | SA | VSA | O | E | SA | VSA | O | E | SA | VSA | O | E | SA | |
| Wave propagation and different kinds of waves | | | | 1(1) | 4(1) | 2(1) | | | | | 1(1) | | | | 8(4) |
| Acoustics of buildings | | | 1(1) | 1(1) | | | 1(1) | | | | | | | | 3(3) |
| Superposition Principle | | 2(1) | | | | | | 1(1) | | | | | | | 3(2) |
| Musical Sounds | | | | | | | 1(1) | | | | | 1(1) | | | 2(2) |
| Stationary Waves and Normal modes. | | | | | | 2(1) | | | | 2(1) | | | | | 4(2) |
| Beats and Doppler Effect | 5(1) | | | | | | | | | | | | | | 5(1) |
| Sub Totals | 5(1) | 2(1) | 1(1) | 2(2) | 4(1) | 4(2) | 2(2) | 1(1) | | 2(1) | 1(1) | 1(1) | | | |
| | 10(5) | | | | 11(6) | | | | 4(3) | | | | | | 25(14) |

Notes: Figures within brackets indicate the number of questions and figures outside the brackets indic marks.

| Summary: | | | | |
|---|---|---|---|---|
| Essay (E) | No. | 1 | Marks | 5 |
| Short Answer(SA) | No. | 4 | Marks | 3 |
| Very Short Answer(VSA) | No. | 4 | Marks | 4 |
| Objective(O) | No. | 4 | Marks | 4 |
| Numerical | No. | 1 | Marks | 4 |

# UNIT TEST

Unit : Waves
Class : XI
Time : 30 Mts.
Marks : 25

## INSTRUCTIONS

1. All questions are compulsory.

2. Questions 1-4 are multiple choice type of 1 mark each. For each question four alternatives are given out of which ONLY ONE is correct. Write in the answer sheet A,B,C and D that corresponds to the correct answer along with its question number. Question 5-8 are very short answer type each to be answered within a line or two.

3. Questions 9-12 are short answer type question of 2 marks each. The answer should be within 40 words each. Question 13 is a problem of 4 marks.

4. Question 14 is long answer type question of 5 marks to be answered in not more than 150 words.

## QUESTIONS

1. What remains constant as soundwaves travel from one medium into another?

   A. Velocity

   B. Frequency

   C. Wave length

   D. None of the above.

2. The prolonging of sound after the source has been switched off is called

   A. Feed back.

   B. reverberation.

   C. rarefaction.

   D. comprehension.

3. Principle of superposition is applicable to

   A. sound waves only.

   B. light waves only.

   C. radio waves only.

   D. any type of waves.

4. The male voice can be distinguished from female voice due to

   A. quality

   B. pitch

   C. frequency

   D. all the above.

5. Explain why the walls and ceiling of an auditorium should not be curved?

6. Explain how a room can be made dead?

7. A good musical sound should have more, or less number of harmonics. Explain.

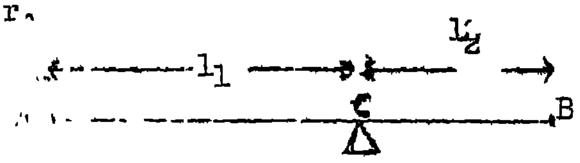
8. The phase difference between two points on a progressive wave is $3\pi/4$. What will be the corresponding path difference?

9. State the principle of superposition. Distinguish between constructive and destructive interference(two points).

10. Explain why the velocity of sound is greater in solids than in liquids?

11. How many nodes and antinodes are there in the 5th harmonic of a stationary wave in an air column of a closed pipe? Draw a figure to them.

12. A bridge divides a sonometer wire into two parts as shown in the figure. Two parts of the string are plucked together, and 6 beats/second are heard. When the bridge is moved slightly, the number of beats heard per second increases to [illegible]. In which direction is the bridge moved? Justify your answer.



13. The equation of a transverse wave is $y = 3 \sin \pi (0.02x - t)$ where y, x are in cm and t in seconds. Write the values of the following physical quantities.

   (i) Amplitude
   (ii) Wavelength
   (iii) period
   (iv) Frequency.

14. Prove that the beat frequency between two simple harmonic motion is equal to the difference between their frequencies.

## KEY/MARKING SCHEME

| S.No. | Value Points | Marks | Total |
|---|---|---|---|
| 1. | B | 1 | 1 |
| 2. | B | 1 | 1 |
| 3. | D | 1 | 1 |
| 4. | D | 1 | 1 |
| 5. | To prevent reverberation. | 1 | 1 |
| 6. | When there are no reverberation. | 1 | 1 |
| 7. | More harmonics explanation | 1 | 1 |
| 8. | Path difference is 5/8 λ | 1 | 1 |
| 9. | (i) Statement of principle. | 1 | |
| | (ii) Distinction. | 1 | 2 |
| 10. | (i) Elasticity is more. | 1 | |
| | (ii) Density is more. | 1 | 2 |
| 11. | (i) There are three nodes and three anti-nodes. | | |
| | (ii) Figure | 1 | 2 |
| 12. | (i) Since $n \propto 1/l$, $l$ should be reduced. | 1 | |
| | (ii) Bridge should move towards B. | 1 | 2 |
| 13. | (i) Amplitude = $3 \times 10^{-2}$ m | 1 | |
| | (ii) Wavelength = 1 m | 1 | |
| | (iii) Velocity = 0.5 m | 1 | |
| | (iv) Frequency = 0.5 $\text{sec}^{-1}$ | 1 | 4 |
| 14. | (i) Equations of two S.H.M. | 1 | |
| | (ii) Applying superposition principle | 1 | |
| | (iii) Simplification and analysis. | 2 | |
| | (iv) Result | 1 | 5 |

## QUESTION-WISE ANALYSIS

| S.No. | Objective | Specification | Sub-Unit | Form of question | Marks Allotted | Estimated Time in mts. | Estimated Difficult level |
|---|---|---|---|---|---|---|---|
| 1. | K | Recalls | Wave propagation | O | 1 | 1 | Easy |
| 2. | K | Recalls | Acustics of Building | O | 1 | 1 | " |
| 3. | U | Recalls | Superposition principle | O | 1 | 1 | " |
| 4. | A | Recalls | Musical sounds | O | 1 | 1 | Difficult |
| 5. | K | Recalls | Acoustics of Buildings | VSA | 1 | 1 | Easy |
| 6. | K | Explains | do | VSA | 1 | 1 | " |
| 7. | U | Explains | Musical sounds | VSA | 1 | 1 | " |
| 8. | A | Calculates | Wave propagation | VSA | 1 | 1 | Average |
| 9. | K | Recalls | Principle superposition | SA | 2 | 2 | " |
| 10. | U | Explains | Wave propagation | SA | 2 | 1 | " |
| 11. | U | Draws | Stationary waves and Normal modes | SA | 2 | 2 | " |
| 12. | A | Analyses | " | SA | 2 | 2 | Difficult |
| 13. | U | Calculates | Wave propagation. | N | 4 | 4 | Average |
| 14. | K | Recalls | Beats and Doppler Effect | E | 5 | 5 | " |

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